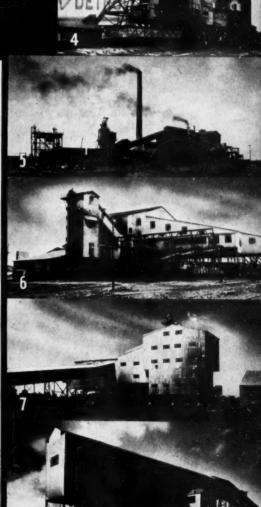
TWENTIETO ANNUAL MODEL-MINING NUMBER

## OCTOBER 1940 CONTROLL STATES OCTOBER 1940 CON

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## THE TEST THAT THE TEST THAT SAVED 30% FOR SAVED YEARS ELEVEN

Back in '29 a large bituminous coal mine wanted to lubrication costs. Extensive tests were made and then superintendent's statement tells the story—

"After making a series of tests covering period of several months we finally decide to adopt SUN Lubricants and by so doing immediately reduced our lubrication of During the eleven year period using Suproducts we have averaged a savings of a proximately 30% and have never had moment's trouble with our equipment due faulty lubrication."

It's case histories like this one that prove why "product and economy minded" operators are specifying to quality, pre-tested SUN Mine Lubricants to help—

- STEP UP EFFICIENCY
- CUT MAINTENANCE COSTS
- REDUCE POWER DRAG
- . INCREASE LUBRICATION EFFICIE

Test SUN Mine Lubricants on a competitive basis in your mine . . . in your own way. Prove to yourself the possible with SUN products.

COMPANY, Philadelphia, P

**SUN MINE Lubricants include:** 

- SUN Pressure Greases
- SUN Compressor Oils
- SUN Journal Oils
- · SUN Mine Car Lubricants
- SUN Ball & Roller Bearing Greases



SUN MINE LUBRICANT

PETROLEUM PRODUCTS FOR ALL INDUSTRIES



### 300 cords on their way to a fire

### A typical example of Goodrich improvement in rubber

W HY do firemen slide down brass poles? Because every second counts in getting water to the fire—less than a minute may decide between destruction and safety for lives and building.

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Fire hose had always been heavy—precious moments were wasted lugging it from hydrant to fire. Every hose manufacturer tried to do something about it, but weight could be saved only at loss of strength. Then Goodrich had the idea you see in the picture—300 cords on their way to a fire

Among the 380 Goodrich development engineers are some who specialize in textiles. They knew that, for a given weight of cotton yarn, you get greater strength if you divide it into more cords, and that you still further increase strength if you can hold all cords at equal tension during weaving.

These engineers developed a special cord and made a fire hose jacket with double the number formerly used. Then they invented a loom attachment which holds all cords at exactly equal tension

at the instant of weaving. With these two increases in burst strength, Goodrich could make fire hose lighter without loss of strength. Result is a hose that can be dragged to the fire, up ladders, into buildings more quickly, and today is safeguarding thousands of lives with its exceptional strength. The B. F. Goodrich Company, Mechanical Division, Akron, O.

### Goodrich

ALL products problems IN RUBBER

(Another story of Goodrich development work appears on pages 161 and 203)

October, 1940 - COAL AGE

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...and how

If the

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HULBURT

### do YOU buy lubricants?

Is your mind closed—locked by habit—on this subject of lubrication?

Or, is it open to PROOF of the advantages offered by a lubricant engineered for coal mining equipment exclusively?

More than 1,500 coal mines have tested and are using Hulburt Quality Grease because it costs less per ton mined. They proved the savings on their own equipment.

If this kind of proof is convincing to you, you are invited to make your own tests. Ask us for details.

### **HULBURT OIL & GREASE COMPANY**

Specialists in Coal Mine Lubrication

PHILADELPHIA, PENNSYLVANIA



QUALITY GREASE

## THE CALLE



Simplex Wire & Cable Company, 79 Sidney Street, Cambridge, Mass.

### Simplex -TIREX The only cable armored with Selenium Rubber

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full effi shif

> job for

Machine-minded southern Illinois is the theme of this issue, the 20th Annual Model Mining Number of Coal Age. The material on which the issue is based was derived from visits to 23 deep and eight strip mines and interviews with scores of executives and operating men, whose unstinted cooperation is here gratefully acknowledged. . . . An efficiency of 13.1 tons per manshift underground is concrete evidence of how well southern Illinois deep mines are doing their job and laying the foundations for the future, as outlined in the articles on mechanical loading (p. 76), face preparation (p. 88) and transportation (p. 96) . . . Thick overburden and lots of rock feature southern Illinois stripping. The stripping methods article (p. 108) tells how these difficulties are overcome, while the transportation article (p. 112) reviews advances in strip haulage, now largely automotive. . . . Coal preparation in southern Illinois, one of the largest users of me-

CONTINUED ON PAGE 71



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### Coal Age

Volume 45

Number 10

### TWENTIETH ANNUAL MODEL MINING NUMBER

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P DAWSON HALL

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Push button control in midwestern tipple, which works through combination circuit breakers and linestarters shown in inset.



### THEIR EXPERIENCE WORKS FOR YOU

When you place an order with a Westinghouse salesman, you obtain not only the equipment itself, but also the benefit of a group of "specialists", skilled in applying electrical equipment to mining operations. And usually, you pay no more than for ordinary equipment that lacks this background of specialized knowledge and experience.

Tune in "Musical Americana," N. B. C. Red Network, Coast-to-Coast, every Thursday evening.

### AND GIVES FLEXIBILITY OF POWER SUPPLY WITH MAXIMUM SAFETY FOR WORKERS

In this tipple for a midwestern strip mine, the operator has at his finger tips flexible and safe control of 78 motors, ranging in size from 3/4 hp up to 150 hp. He commands the 1800 hp of electrical energy which can handle 1,000 tons of coal every hour.

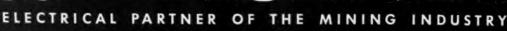
This ability to develop electrical mining equipment with proved safety and flexibility can come only from a 50-year-old combination of electrical and mining experience such as Westinghouse places at your service. In every unit of electrical equipment furnished for this mine, including portable substations, new protective voltage limiting reactors and "De-ion" air circuit breakers, Westinghouse has called upon its years of experience in designing and building mining equipment.

You can depend upon Westinghouse to deliver to you the utmost in flexibility and safety for your electrical equipment. Our local offices will give you fast, capable action on any requirement.

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY
EAST PITTSBURGH, PA.

J-94386

### Westinghouse





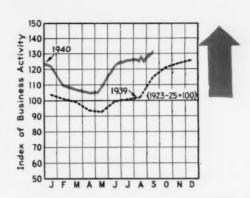
(CONTINUED FROM PAGE 5)

chanical cleaners, is detailed in the article starting on p. 134, followed (p. 148) by an analysis of merchandising methods. Rounding out the southern Illinois picture are articles on deep-mine pumping and drainage (p. 104), deep- and strip-mine electrification (pp. 115 and 124) and maintenance and supplies (p. 127). . . . Turning to the future, articles scheduled for early publication include a description of how the Binkley Mining Co. found knocking off overburden peaks hydraulically a cheap way of helping out the stripper at Bobolink mine. . . . For power and electrical men, H. C. Livingston will summarize additions to the Rock Springs (Wyo.) power plant of the Union Pacific Coal Co. to increase capacity 7,500 kw. . . . Drawslate is the biggest headache to Pittsburgh - seam operators. 'How shaker conveyors with duckbills permit holding the drawslate at the Jefferson Coal & Coke Co. mine, Avella, Pa., and increase operating efficiency will be told by Claude Ferguson in an early issue. . . . The Coal Age front cover this month shows sixteen typical southern Illinois preparation plants, identified on p. 135. The cover was released for editorial use by the Tide Water Associated Oil Co., whose adverfisement occupied that spot last October.

### HOW'S BUSINESS

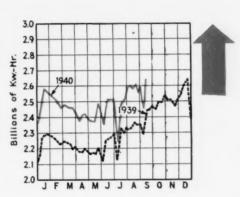
### GENERAL BUSINESS CONDITIONS

Business, according to Business Week, has entered what might be called "the unanimous phase," with everything going up. In the week ended Sept. 21 the index reached a new high for the year at 131.5, the 1929 high of 135.3 being within arm's length. Steel operations have pushed up, automobile output has increased, and commodity prices have tremed up. Risks for business men from now on lie on the side of over-cautiousness, with increasing costs in the offing.



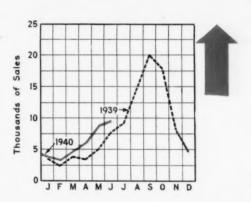
### ELECTRICAL POWER OUTPUT

Output of electric energy by the electric light and power industry is nearing the all-time high. Production for the five weeks since our last report, according to the Edison Electric Institute, was: Aug. 17, 2,606,000,000 kw.-hr.; Aug. 24, 2,571,000,000; Aug. 31, 2,601,000,000; Sept. 7, 2,463,000,000; Sept. 14, 2,638,634,000 kw.-hr., or less than 0.1 per cent short of the all-time peak recorded last December. This was a gain of 7.9 per cent over the corresponding week of last year.



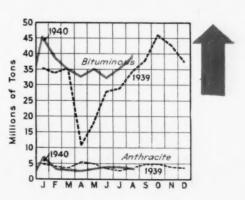
### COAL STOKER SALES

Mechanical stoker sales in the United States in June last totaled 9,986 units (U. S. Bureau of the Census from 107 manufacturers), compared with 8,415 in the preceding month and 7,943 in June, 1939. Sales of small units in June last were: Class 1 (under 61 lb. of coal per hour), 9,124 (bituminous, 8,143; anthracite, 981); Class 2 (61-100 lb. per hour), 351 (bituminous, 333; anthracite, 18); Class 3 (101-300 lb. per hour), 294 (Census Department report for July delayed).



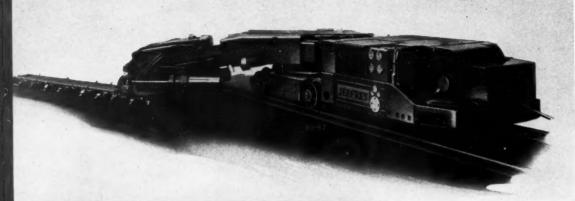
### COAL PRODUCTION

Bituminous coal produced by United States mines in August last (preliminary) totaled 39,240,000 net tons, according to the Bituminous Coal Division, U. S. Department of the Interior, which compares with 36,080,000 tons in the preceding month and 35,016,000 tons in August, 1939. Anthracite tonnage in August last was 3,790,000 (preliminary), according to the U. S. Bureau of Mines, against 4,408,000 tons (revised) in the preceding month and 3,883,000 tons in August, 1939.



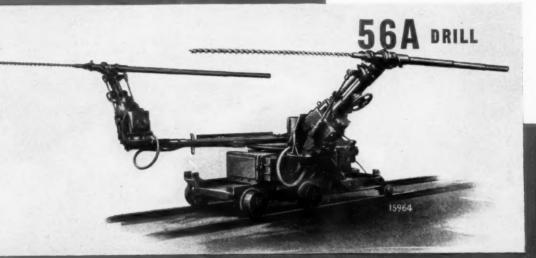
### MEFFREY 1349 3

29U CUTTER



Jeffrey 29-U Universal coal cutter is shown in undercutting position at the left. Send for Catalog No. 705.

Patented and Pats Pending. Also licensed under the patents of E. C. Morgan. Patents Nos. 1706961 — 1706962 — 1707132 — 1707133 — 1953325 — 1953326.



Jeffrey 56-A drilling machine (left) for fast drilling and properly shot holes. Catalog No. 688. (Patented).



Jeffrey L-400 loading machine, a high-capacity unit which works ideally with the two machines shown above. Catalog No. 205. [Patented].

### COORDINATE PRODUCTION at the face —high speed tramming from place to place

The best spot to initiate a more perfect coordination of the production cycle is at the face ... here you literally set the pace for your entire operation. Through the use of mechanized equipment . the kind that Jeffrey builds . . especially designed to compliment each other in range, speed and capacity . . waste motion and delays at this limited operating point can be substantially reduced . . and immediately, an accelerated flow of production is effected.

The Jeffrey BIG Three (left) consisting of the highly flexible 29-U cutter, high speed 56-A driller, and high capacity L-400 loader . . offers you just such a thoroughly-balanced combination of mechanized units. All three are track-mounted, move in and out quickly . . maintain a constant, low-cost production level at all times.

Put the Jeffrey BIG Three to work at the face as a truly constructive step toward realizing greater all-over efficiency, lower cost per ton, and increased profits. Our engineering facilities are at your disposal.

### THE JEFFREY MANUFACTURING COMPANY

912-99 NORTH FOURTH STREET

COLUMBUS, OHIO

OTHER JEFFREY EQUIPMENT

In the model where in "Southern limited you will find many Jence, units . . speeding up production and lowering costs. A few typical installations in this important mining area are shown below.



Type N stoker-coal crusher in



Jeffrey single rall crusher reducing coal to 3 x 3/2 in in proparate plant—West Frenkfort, Illinois.



Jeffrey-Traylor etectric vibrating



General exterior view of Jeffrey preparation plant with modern soa cleaning facilities.—West Frankfort



Many in the Southern Illinois



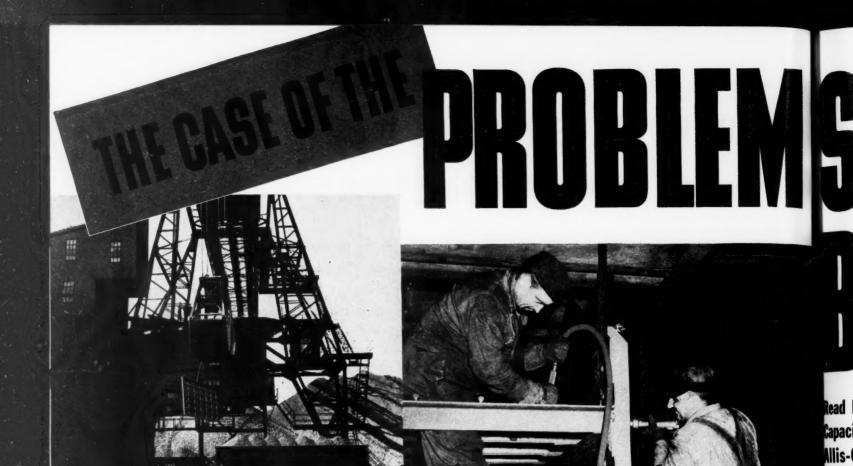
Jeffrey 13-fee trelley lecomotive hauling trip of leaded care to sheft hatter the leader.



followy 35-B coal cuttor taking its co



Jeffrey Aerodyne mine fan installation supplying air to workings in this



BECAUSE OF LIMITED CRANE FACILITIES, THE STAkleen Screen had to be hoisted up in sections to Northwestern Fuel's Bridge No. 1. That meant that the screen had to be assembled at the factory for alignment and testing, disassembled and shipped, hoisted into place, and riveted on the job — all part of Allis-Chalmers cooperative engineering.

THE NON-BLINDING performance of the new Allis-Chalmers Sta-Kleen Screen is the result of the positive primary vibration that has made the Allis-Chalmers Low-Head the fastest selling screen on the market today . . . plus the secondary vibration imparted by special rubber balls to keep the openings free.



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## SCREEN ON BRIDGE NO.1

Read How Northwestern Fuel Co. Gets Added Flexibility . . . Increases Capacity . . . Reduces Slack by Beating Blinding . . . with the New Allis-Chalmers Sta-Kleen Screen. Here's How You Can Use Allis-Chalmers Cooperative Engineering to Lick Production Problems . . . Cut Operating Costs . . . Get the Right Machine for your Job!

NORTHWESTERN FUEL CO. had a tough problem on their hands. They had to increase capacity on their Bridge No. 1 in Milwaukee . . . get finer sizing to meet the demand of the growing stoker market. But here's what they were up against . . .

Because the cloth blinded when the coal was wet,  $\frac{3}{8}$  inch openings were the smallest that could be used on the two old shaker type screens on this bridge. Consequently, as high as 40% of the feed was passing through as slack that brought low prices.

Then, too, head space was limited . . . the screen had to be installed in sections because of inadequate crane facilities and because it was undesirable to cut away any members of the movable bridge. And it had to be flexible enough for quick change-over to any of five sizes of prepared stoker.

A-C Specialists Work For Them!

Northwestern's engineers brought their problem to Allis-Chalmers. Screening specialists went to work for them . . . just as they will for you if a problem comes up in your plant. After careful analysis, a 56 x 14 triple deck Low-Head Vibrating Screen with the new Sta-Kleen lower deck was recommended. And here's what the customer's engineers have to say about its performance . . .

19

"The amount of slack passing through the screen is less than one-third the former amount! It is screening at 90% efficiency ... and the change-over to any one of the five different sizes can be made in a few seconds by simply operating a flap gate."

What's more, although the present demand calls for sizes down to only ¼ inch, the positive secondary vibration imparted by the special rubber balls eliminates blinding to such an extent that the lower Sta-Kleen deck can be fitted with ⅓ inch cloth when the call comes for a finer stoker product.

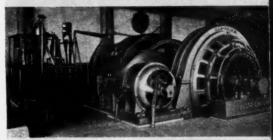
### Put A-C Engineering to Work For You!

That's an example of what we like to call "cooperative engineering." And you'll find, too, that whenever you place an order with Allis-Chalmers, you get all the benefits of the combined experience, analysis, versatility and research of a staff of engineering, laboratory and field specialists.

Put Allis-Chalmers cooperative engineering to work for you. Let us work with your own engineers to give you the *right* machine for the job you want done. For complete information call the district office near you. Or write direct to Allis-Chalmers, Milwaukee.

A-1292

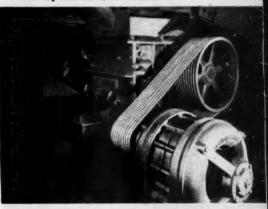
### ALLIS-CHALMERS PRODUCTS CUT OPERATING COSTS IN SOUTHERN ILLINOIS FIELD



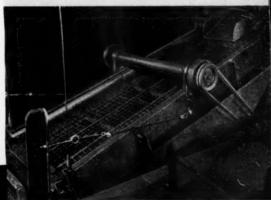
SINCE 1923 THIS 29,000 POUND ROPE pull, balanced single drum Allis-Chalmers hoist has been giving efficient service for an Illinois producer.



FOR DRAINAGE, WASHING AND allied uses, Allis-Chalmers SSUnit Pumps give more water at less cost. In the preparation plant of this mine, 41 Allis-Chalmers Lo-Maintenance Motors prove why they're a favorite wherever trouble-free operation is essential.



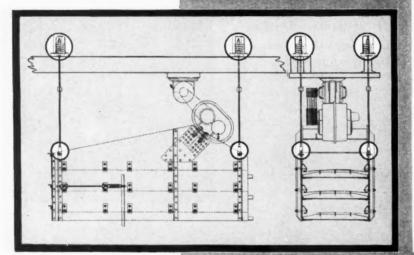
ALL OVER THE SOUTHERN ILLInois field, combinations of positive, slipless Texrope Drives and Lo-Maintenance Motors, like the ones shown here, give low-cost, long-life service.



THIS 4 FT BY 10 FT DOUBLE DECK Allis-Chalmers Aero-Vibe Screen sizes washed coal for one of the Illinois producers — just one of the many Allis-Chalmers screens used in this field.







On ALLIS CHALMERS Low Head Horizontal Screens, Electroline-Fiege Connectors have proved their absolute reliability in years of service during which they have been standard equipment. EDGE AR HA

ANTS

ARPE

JMP5

G A

PARA

SPOS

OPPE

ATTEL

TAL

DARS

EDGI

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UMPS

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Open end or Clevis Type Connectors hold the cable at the four corners of the screen body and Stud type Connectors secure the spring-mounted top suspension.

Electroline-Fiege Connectors have not only contributed strength, reliability and long life to Allis-Chalmers Vibrating Screens but have provided minimum installation cost and proof of proper assembly by means of the unique Electroline-Fiege Inspection Hole.

• In many gruelling services of this type the built-in vibration damper, exclusive in Electroline-Fiege Connectors, has tripled wire rope life.

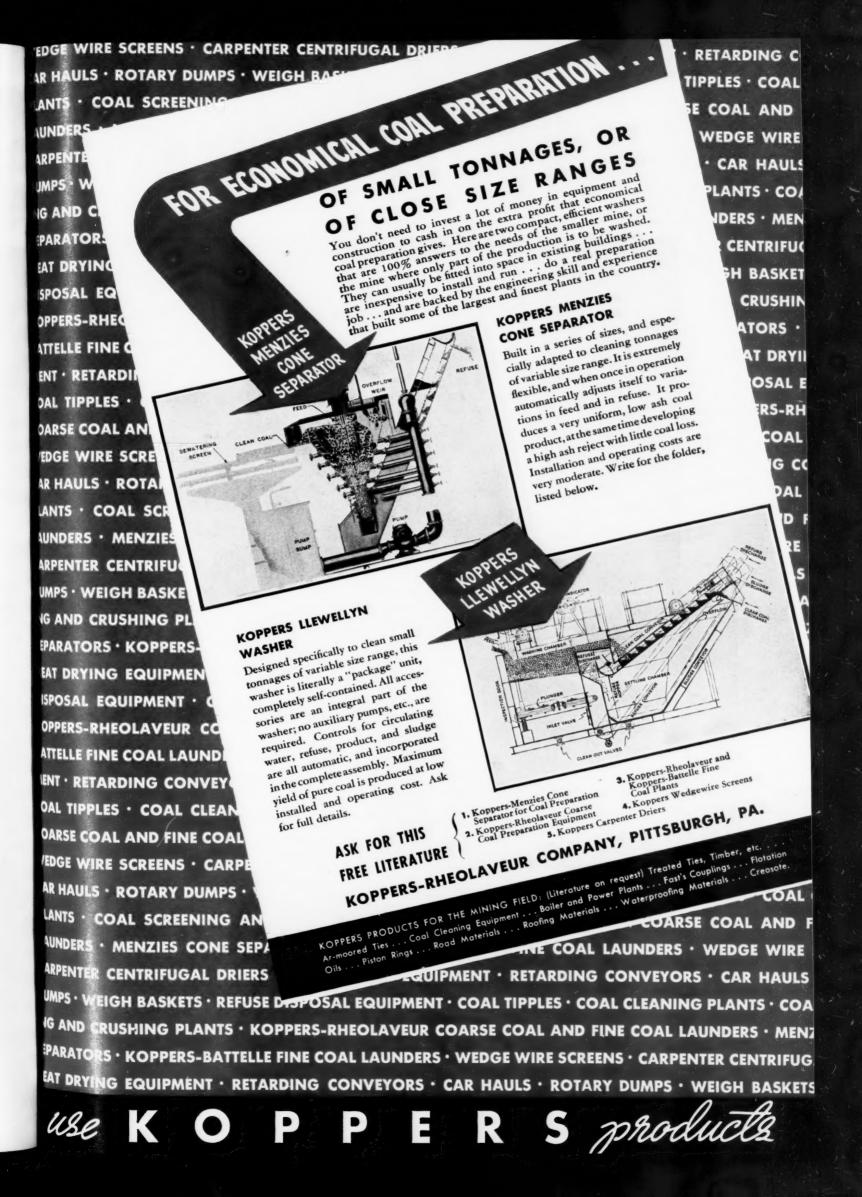




Electroline Company

4020 SOUTH LA SALLE STREET

CHICAGO, ILLINOIS



### Operator Steps



Easy to use in any type of gun, workable in any weather, Texaco Olympian Mine Car Grease reduces greasing time, lengthens bearing life.



TEXACO DEALERS INVITE YOU to enjoy Fred Allen in the new full-hour program of the Texaco Star Theatre . . . with Kenny Baker, Al Goodman's Orchestra and a great cast. Every Wednesday Night, Columbia Network. 9:00 E.S.T., 8:00 C.S.T., 10:00 M.S.T., 9:00 P.S.T.



TEXACO

### Mine Car Performance



HEAD FRAME at New Orient Mine (10,000 tons a day capacity) where Texaco Olympian Mine Car Grease is in use.

ASIER STARTING, faster trips, fewer breakdowns ... these are some of the operating improvements secured on MINE CARS at the New Orient Mine of the Chicago, Wilmington & Franklin Coal Co., one of the largest mines in the U. S., if not in the world.

The lubricant responsible for this outstanding improvement is TEXACO OLYMPIAN MINE CAR GREASE.

Containing carefully refined mineral oil of selected viscosities, *Texaco Olympian Mine Car Grease* is stable, resisting leakage in warm weather, yet handling easily in cold.

Its use provides effective, long-lasting lubrication. Several different consistencies of *Texaco Olympian* permit the selection of the proper grade of wear-reducing lubricant for any type of bearing.

Trained lubrication engineers will gladly cooperate in making savings with *Texaco Olympian Mine Car Grease* in your equipment. Phone the nearest of more than 2300 Texaco warehousing points in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York, N. Y.

### CITMPIAN MINE CAR GREASE

### Here's the Difference





1¼" Cartridge in 1½" Drill Hole

### Only One-Half Inch Variation Gives Four Times as much Air Space

A  $1\frac{1}{4}$ " cartridge of explosive in a 2-inch bore hole has almost *four times* as much air space around it as the same  $1\frac{1}{4}$ " cartridge in a bore hole just one-half inch smaller in diameter!

That's why variation in drill hole diameter is one factor which can make an explosive act like a different grade.

Look at the illustration! The  $1\frac{1}{4}$ " diameter cartridge is a tight fit and well confined in the smaller bore hole. But, in the bore hole just half an inch larger there is almost four times as much air space to cushion the blast. What's more, the greater confinement of the smaller hole tends to increase the velocity of the explosive.

Naturally, such factors affect the percentage of lump coal produced. It may be, of course, that one situation will require air spacing, another closer confinement, but:

The more uniform are drill hole diameters, the closer the drills are watched, the more uniform will be blasting results in all sections of the mine.

This is but one suggestion Atlas Technical Service can make to help. Your knowledge of coal, plus Atlas' knowledge of explosives, can form a team that will get results—in better blasting at lower cost.

ATLAS
TECHNICAL
SERVICE

can help on your blasting problems

No. 2 of a Series

ATLAS EXPLOSIVES "Everything for Blasting"



ATLAS POWDER COMPANY, Wilmington, Del. · Offices in principal cities · Cable Address-Atpowco

IN ILLINOYS JOY

equipped the first fully mechanized mine in 1926 with JOY 5-BU Loaders

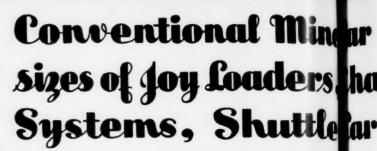


Today-better than 75% of the mechanically loaded deep shaft tonnage in the state of Illinois is loaded with Joy Loaders

### Over 470 Joy Loaders operating in Illinoi na







### JOY has them

Not only has JOY played an important part in the modernization of mining in Illinois but has been instrumental in reducing face and section costs to the minimum in all of the coal producing states



TOP: - JOY 11-BU loading mine car at Peabody Number 18 Mine.

CENTER: - JOY 11-BU at Bell & Zoller



LOWER:— JOY 8-BU Loader discharging into chain conveyor at Buckhorn Mine of Consolidated Coal Company...



RIGHT:— JOY Belt Conveyor on main haulage at Bankston Creek No. 4.

wi naintain Joy Leadership and Economy...

inar haulage hehind all rs hain & Belt Conveyor tle ar Transportion .

mill in Illinois-









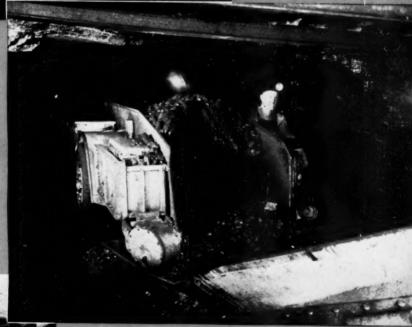
ABOVE:— Shuttle Car being loaded at Peabody No. 43 Mine.

RIGHT:— Shuttle Car discharging into elevator at Consolidated Coal Co., Buckhom Mine





BELOW:— Elevator carrying coal from Shuttle Car to trip of mine cars at Peabody No. 43 Mine



JOY MANUFACTURING COMPANY

FRANKLIN ... PENNSYLVANIA

JOY LOADERS AND SHUTTLE CARS produce



### LOW COST COAL IN ILLINOIS





ABOVE:— Loading JOY Shuttle Car at Jefferson No. 20 Minof Consolidated Coal Company





LEFT:— JOY Shuttle Car enroute to unloading station, Peabody No. 43



BELOW:—JOYT-1 Mining Machine Truck hauling shortwall cutter at Buckhorn Mine of Consolidated Coal Company

Ask a JOY Engineer about savings in face and section costs with JOY LOADERS & SHUTTLE CARS

JOY MANUFACTURING CO. FRANKLIN ... PENNSYLVANIA

### Here's LEADERSHIP that counts!



in Illinois Workmen's Compensation premiums during the 5 past

in Safety Training

in efficiency of Claim Services and financial security



Established in Illinois in 1917 the Bituminous for more than 23 years has insured the compensation risks of the industry whose name it bears, always trying to improve its service and maintain high safety standards which result in increased efficiency, lower operating costs and more continuous employment for the workmen. Total admitted assets this year topped the seven million mark and capital and surplus as regards policyholders was \$1,500,000.00 on June 30th. Cash and U. S. Gov't. bonds represent 79% of total assets. For the additional security of policyholders there is reinsurance, in excess of \$20,000, up to one million dollars to protect the Bituminous in the event of catastrophe or unusual loss for every policy issued. It's a company tradition that just claims are paid promptly.



Operating in 19 states, including Indiana, Iowa, Kentucky, Virginia, Tennessee, Alabama, Illinois.

### ILLINOIS Service Offices

Chicago Rock Island Belleville arbondale Terre Haute ★ Workmen's compensation insurance and service is so vital to your business life that you can't afford to select any but the very best insurance carrier. In the country's major soft coal fields a place of honor and trust has for years been reserved for the Bituminous Casualty.

Bituminous Casualty mine safety engineers hold the respect of operators, superintendents and miners for their knowledge and practical application of coal mine safety. Many of them, company officers too, held their first jobs in the mines and they know where to place the feather-line between scientific theory and practical operating methods.

Bituminous Casualty service men are ready to work with you and your men, ready to demonstrate a system of insurance which has established an American precedent for so hazardous a line. Our guaranteed low cost of doing business-far below the average of other companies-is proof of a sympathetic viewpoint in proposing insurance rates which influence your production costs. As a stock company we assume the entire risk covered by a policy, dismissing from your mind the worry of contingent or actual liability often incurred by policyholders of other type carriers.

### ROCK ISLAND

SEND FOR YOUR FREE. COPY OF OUR NEW FOLDER

fishing kit.

"FIRST AID HINTS"	FIRST	AID	HINTS"
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Name	e													*			
Stree	t .								*								
City	Q.	5	tai	te													

### Here's why

Here are a few of the O-B equipped model mines in the Illinois field and some of the O-B items they specify for dependability:

ORIENT NO. I MINE Trolley wire hangers, clamps, frogs and section insulators are predominantly O-B at this mine of the Chicago, Wilmington & Franklin Coal Company.

BANKSTON CREEK NO. 5 All overhead line material at this mine of the Franklin Creek Colliery Company bears the O-B insignia.

OLD BEN COAL CORPOR-ATION Ohio Brass line material is used at all four of the Old Ben Mines, namely, Mines No. 8, 11, 14 and 15. At Old Ben No. 15 mine, all mine drainage pumps are equipped with O-B auto-matic d. c. starters.

ROYALTON NO. 7 MINE Practically all line material and rail bonds installed at this mine of the Franklin County Coal Corporation are of Ohio Brass manufacture.

NEW MONARCH MINE O-B line material is used ex-O-B line material is used ex-clusively at this mine of the Consolidated Coal Company.

ZIEGLER NO. 1 & 2 MINES O-B overhead line material is standard at these Bell and is standard at these bell and Zoller Mines. O-B porce-lain insulators, control ap-paratus and welding equipment are also used.

KATHLEEN MINE Overhead line material at this mine of the Union Collieries Company is principally of Ohio Brass manufacture.

MAJESTIC NO. 14 MINE O-B short "U" rail bonds on 60-lb. main line rail are used at this company's mine.

HARCO NO. 47 MINE This mine uses O-B overhead line mine uses O-B overhead into clusively.

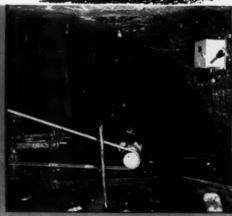
HARRISBURG NO. 43 MINE All overhead line material is of Ohio Brass manufacture at this Peabody Coal Company mine.

BLACK ARROW NO. 18
MINE Ohio Brass line material is used exclusively at this mine of the Peabody Coal Company as well as O-B AW-19 rail bonds.

BUCKHORN MINE overhead line material used at this mine bears the O-B emblem.



The trolley and feeder system at the Kathleen Mine is supported by means of O-B hangers, clamps and porcelain insulators. The rigid crossover also bears the O-B emblem.



Protecting and controlling a pump motor this O-B KSD automatic d. c. motor is installed at the No. 15 mine of the Old Ben Coal Corporation.



Two O-B standard quick break switches are used for sectionalizing feeder at the Kathleen Mine of the Union Collieries Company.

### model mines "0-B DEPENDABILIT

Mine managements that win Coal Age awards and, incidentally, get coal into railroad cars at rock-bottom costs just can't afford to take chances with untried, unproved equipment! And that's why the Model Mines of Illinois, like their predecessors before them, make it a practice to specify "O-B dependability!"

Years of experience have shown them that O-B trolley and feeder material, rail bonds, control devices and locomotive equipment can be relied on . . . can be entrusted with the all-important job of chaperoning electrical power for mine haulage and machinery.

Why jeopardize the performance of expensive face machinery or take chances on bottling up the flow of coal from face to tipple by using any but the best mine materials? A power failure or a haulage breakdown can spell the difference between profit and loss!
Play safe! Specify dependable O-B mine materials!

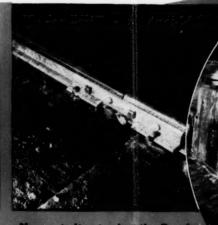
MANSFIELD

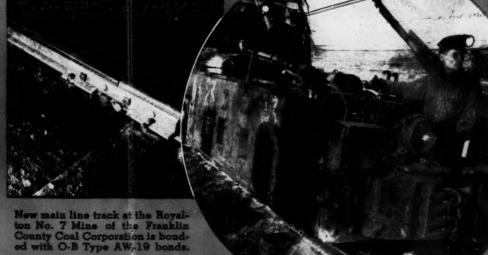
OHIO · U·S·A

Canadian Ohio Brass Company, Ltd., Niagara Falls, Ont., Canada









# PROFITS GO UP You haul LESS TOP, MORE COAL with this AMAZING NEW low-vein locomotive

WHY waste hundreds of thousands of dollars taking useless top out of low-vein haulageways just to accommodate old-fashioned equipment? Now you can get a 15-ton haulage locomotive only 26 inches high—9 inches lower than any other motor with equal weight and power.

Besides compactness, this amazing locomotive

has many features not found on ordinary locomotives, including: air brakes, air sanding, 10-step electro-pneumatic control, air-raised trolley, and adequate space for the motorman and trip rider. Its two 90-hp, high-torque motors start heavy loads quickly and smoothly, with starting currents hardly noticeable at the substation.

### THERE'S A G-E LOCOMOTIVE FOR EVERY JOB



25 tons, trolley, haulage



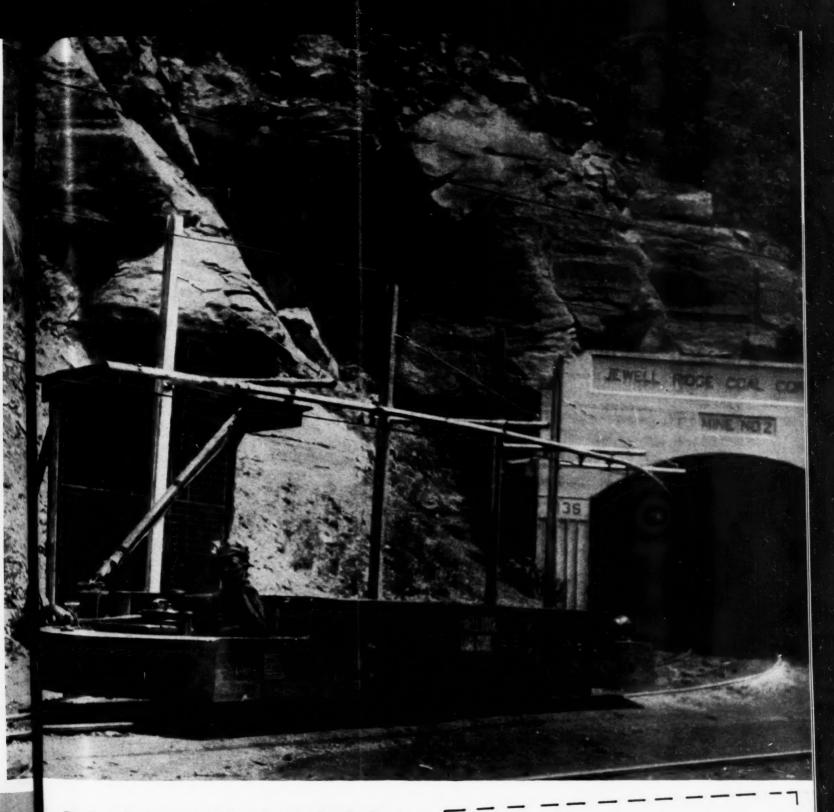
8 tons, cable-reel, sealed-equipped



6 tons, permissible, storage-batter

50 YEARS of experience have given us a vast store of basic knowledge for improving mine motive power. Because G-E locomotives are built entirely in our own factories, we are able to co-ordinate

the improvements and give you modern, moneysaving, completely reliable units. May we show you important advances made recently in cablereel, battery and trolley types?



Don't wait for your old motors to break down. Start cutting haulage costs and earning extra profits quickly—just as soon as you can get one of these locomotives into your mine. General Electric, Schenectady, N. Y.

Now you can get a locomotive to fit your mine instead of digging a mine to fit your locomotives

General Electric, Section A126-6 Schenectady, N. Y.

Send Bulletin GEA-3459, which reveals how your new 15-ton locomotive is held to 26 in. high without sacrificing one important feature.

Also data on .....type locomotives.

Name

Company

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126-6

GENERAL (%) ELECTRIC

### SULLIVAN'S 7AU

### WITH EXTREME REACH, GREAT FLEXI-BILITY, SAFETY AND EASE OF OPERATION SPEEDS PRODUCTION AND LOWERS COSTS!

You get ALL these operating advantages with SULLIVAN 7-AU COAL CUTTERS.

### 1. 100% UNIVERSAL TRACK CUTTER

Overcuts, centercuts, bottomcuts, centershears, ribshears, angleshears, slabcuts, slabshears, has bar tilt and roll—a 100% Universal track cutter.

### 2. EXTREME REACH

20'-6" reach with 9 ft, bar permits cutting a room 41 ft. in width.

### 3. SAVES TIME

Only Universal track cutter available requiring but one laying of track for two cuts—Saves time and facilitates more practical use of Caterpillar mounted loading machines.

### 4. FLEXIBILITY

Reach of machine permits cutting and shearing room necks from straight track—avoids switch usually necessary.

### 5. GREATER CUTTING POWER

A 50 H.P. motor for driving the cutter chain only.

### 6. AMPLY MOTORED

A 30 H.P. motor for driving tramming and hydraulic pump mechanisms.

### 7. SAVES LUBRICATION COSTS

Splash lubrication in dust and oil-tight steel cases, reduces lubrication costs.

### 8. GREAT SELECTIVITY

Tilt and Roll of cutter bar permits accurately following roof, bottom, or impurity band.

### 9. SPEED AND SAFETY

Centrally located dual control permits one man operation and safe mevement through restricted mine passages.

### 10. EASE OF HANDLING

Ease of control permits rapid positioning for cutting.

### 11. MANEUVERABILITY

Flexibility of machine permits tramming around sharp turns.

### 12. AIDS MECHANICAL LOADING

The only track cutter available which can drive 21 ft. rooms with ribs parallel to track—aid to mechanical loading.

### 13. SIMPLICITY OF CHAIN DRIVE

Only five gears in cutter chain drive. This mechanism protected from excessive shock loads by a dependable multiple disc-type slip clutch, operating in a bath of oil.

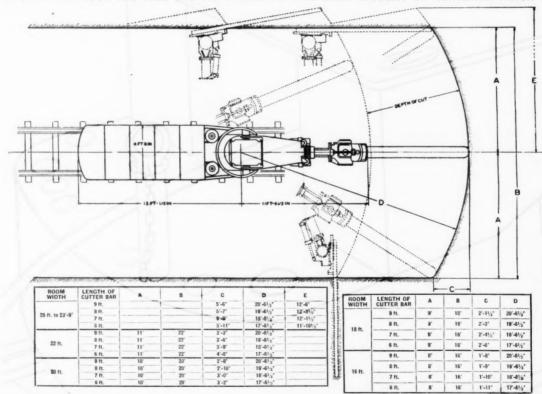
### 14. STRENGTH

All gears and shafts made of carefully selected alloy steels, properly heat treated,

### 15. LONG LIFE

Ball bearings used throughout.

DIAGRAM SHOWING THE FULL CUTTING RANGE OF THIS MOST MODERN OF UNIVERSAL TRACK CUTTERS



Since Sullivan produced the first successful Shortwall cutter in 1892, Sullivan coal cutters have consistently helped to lower production costs for the operator.

Let us furnish you with conclusive proof as to how Sullivan 1940 economies can substantially reduce your production costs. There is a Sullivan representative in your territory. Write, phone or wire any of the offices listed below—no obligation, of course.

The Sullivan 7-AU is licensed under patents to E. C. Morgan. Patents No. 1,706,961-1,706,962-1,707,132-1,953,325-1,953,326



### SULLIVAN EQUIPMENT IS HELPING TO CUT COSTS AT THE FOLLOWING SOUTHERN ILLINOIS PROPERTIES

CHICAGO, WILMINGTON & FRANKLIN COAL CO.
CONSOLIDATED COAL COMPANY
MOFFAT COAL COMPANY
OLD BEN COAL CORPORATION
PEABODY COAL COMPANY
PYRAMID COAL CORPORATION
SAHARA COAL COMPANY
TRUAX TRAER COAL COMPANY
UNITED ELECTRIC COAL COMPANY
VALIER COAL COMPANY
WASSON COAL COMPANY

### SULLIVAN

COAL MINING MACHINES • SCRAPER HAULERS • ROCK LOADERS • HOISTS • CAR PULLERS • AIR COMPRESSORS ROCK DRILLS • CUTTER BIT SHARPENERS AND HEATERS CORE DRILLS AND CORE DRILL CONTRACTING

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CANADIAN SULLIVAN MACHINERY CO. LTD., DUNDAS, ONT.

## A"Solid"Grease With"Fluid"Core

-IDEAL FOR BALL AND ROLLER BEARINGS!

SPECIALLY DESIGNED for precision-made anti-friction bearings in your mechanized mine—Gargoyle BRB Greases work on the "cavitation" principle!

A FLUID CORE of grease helps assure continuous lubrication . . . minimum internal friction . . . cool bearings . . . reduced power consumption.

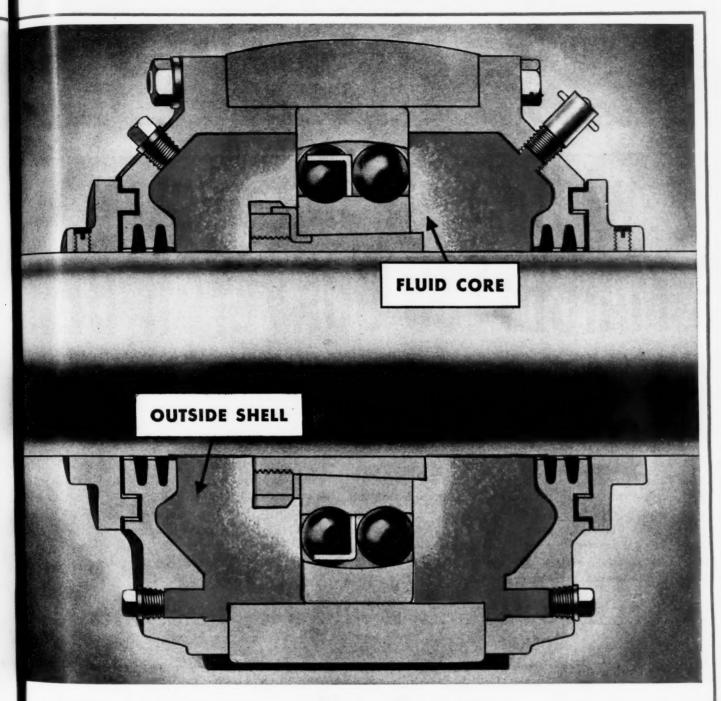
THE OUTSIDE SHELL of idle grease remains sufficiently stiff to prevent wasteful leakage and, at the same time, seal out harmful dirt.

### Socony-Vacuum for

Youll Profit from these "Exclusives"

a Socony-Vacuum man backed by 74 years' experience...the greatest in the Petroleum Industry.

A COMPLETE LINE of Lubricants ... the scientifically correct lubricant for every type of machine you now own ... or will buy.



### Correct Lubrication

needs ... developed in close cooperation with machine builders by famous Socony-Vacuum laboratories.

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ant wn guide our engineers in recommending the right use of these lubricants to earn Lubrication Profits for you.

DISTRIBUTION throughout the world of high-quality lubricants.

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### Again U.S. RUBBER

### with 48 ounce duck U.S. MATCHLESS CONVEYOR BELT

Permits Bigger Conveyor Units To Do Bigger Conveying Jobs...

Also Better Replacements at Lower Costs

U. S. Rubber again extends conveyor belthorizons by introducing U. S. Matchless Conveyor Belts with 48-oz. duck... just as it did a decade ago when it originated 42-oz. duck in the same brand.

This new duck provides 1/3rd greater strength than 42-oz., but weighs only 1/7th more. This greater strength of U. S. 48-oz. duck in U. S. Matchless Conveyor Belts now makes possible:

longer centers...higher lifts...with single-unit conveyors...than ever before ...one unit on many jobs where two were formerly required...fewer units on long, multiple-unit jobs.

And being 1/3rd stronger than 42-oz. U. S. Matchless Conveyor Belt with 48-oz. duck requires fewer plies to handle a given job... a decided advantage in belt cost.

Having the same soft resilient weave that has been a feature of U. S. Matchless 42-oz. Duck Conveyor Belts, this new, stronger U. S. 48-oz. duck has the same elastic resilience against cracking and has maximum resistance to impact of large heavy lumps.

Stronger U. S. Matchless Conveyor Belts made with U. S. 48-oz. duck are flexible, trough perfectly, train easily.

### UNITED STATES RUBBER COMPANY

ROCKEFELLER CENTER . NEW YORK



Rolled up inside these two cases is the second U. S. Matchless 48-oz. Duck Conveyor Belt, 1540 feet long, 54 in. 10 x 12-ply, weighing 47,635 lb. net. Built to handle a stone conveying job, this gigantic belt patiently waits to replace a U. S. Matchless 42-oz. Duck Conveyor Belt that has already handled over 24,000,000 tons during the last 10 years.



Three More Rolls of U. S. Matchless 48-oz. Duck Conveyor Belt going out to take on three of the toughest jobs in an iron-ore plant-another company in another industry recognizing the advantages of the greater strength and economy of U. S. Matchless Conveyor Belts with 48-oz. duck.

### Leads the way

Here's the First 48-oz. duck belt ever made-a U. S. Matchless Conveyor Belt-a super belt-so rugged that it gives longer, money-saving service even under the most severe kind of mining operations. It is successfully operating in the Southern Illinois Coal field on the largest single-unit slope-conveyor ever built. Conveys run-of-mine coal at 1000 T.P.H. from underground to modern preparation plant, involving a lift of 206 ft., 16.5 degree incline, 710 ft. centers, 300 H.P. United States Rubber Co. was the only conveyor belt manufacturer that could convince designers and owners of this conveying equipment that a belt could be provided strong enough and with required flexibility to permit a single-unit conveyor to perform this gigantic conveying job successfully. This belt has 9 plies; is 54 in. wide; weighs 35,000 lbs. PADE MARK SPECIFICATIONS"

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### MORE THAN 4,500 MINE CARS TIMKEN BEARINGS ARE USED ILLINOIS MINES . . .



Timken Bearing Equipped mine cars operated by the Bell & Zoller Coal & Mining Company.



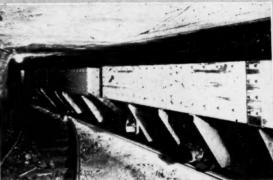
Timken Bearing Equipped 20-ton mine locomotive operated by Chicago, Wilmington & Franklin Coal Company.



Timken Bearing Equipped mine cars at Bankston Creek No. 5 Mine, Sahara Coal Company.



Timken Bearing Equipped mine cars at Orient No. 1 Mine, Chicago, Wilmington & Franklin Coal Company.

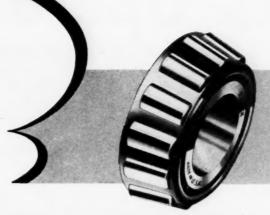


11-Ton mine cars equipped with TIMKEN Bearings in use at Buckhorn Mine of Consolidated Coal Company.



4-Ton mine car equipped with TIMKEN Bearings as used at No. 15 Mine, Old Ben Coal Corporation.

### EQUIPPED WITH IN SOUTHERN



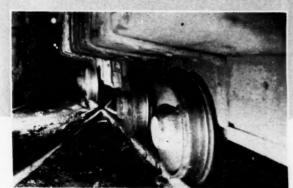
The following are the principal coal mine operators in the Southern Illinois field using Timken Bearing Equipped mine cars:

Bell & Zoller Coal & Mining Company
Chicago, Wilmington & Franklin Coal Company
Franklin County Coal Corporation
Old Ben Coal Corporation
Sahara Coal Company
Union Colliery Company

In addition to the mine cars, these companies operate a considerable amount of other equipment in which TIMKEN Bearings are used. This equipment includes mine locomotives, loaders, belt conveyors, ventilating fans and electric motors.

The greater the extent of mine mechanization, the more extensively TIMKEN Bearings are employed—for no other single factor has such wide-spread influence on speed, efficiency, endurance and economy in equipment of every kind. Over 1,000 mine operators know from experience it pays to specify Timken Bearing Equipped mine cars.

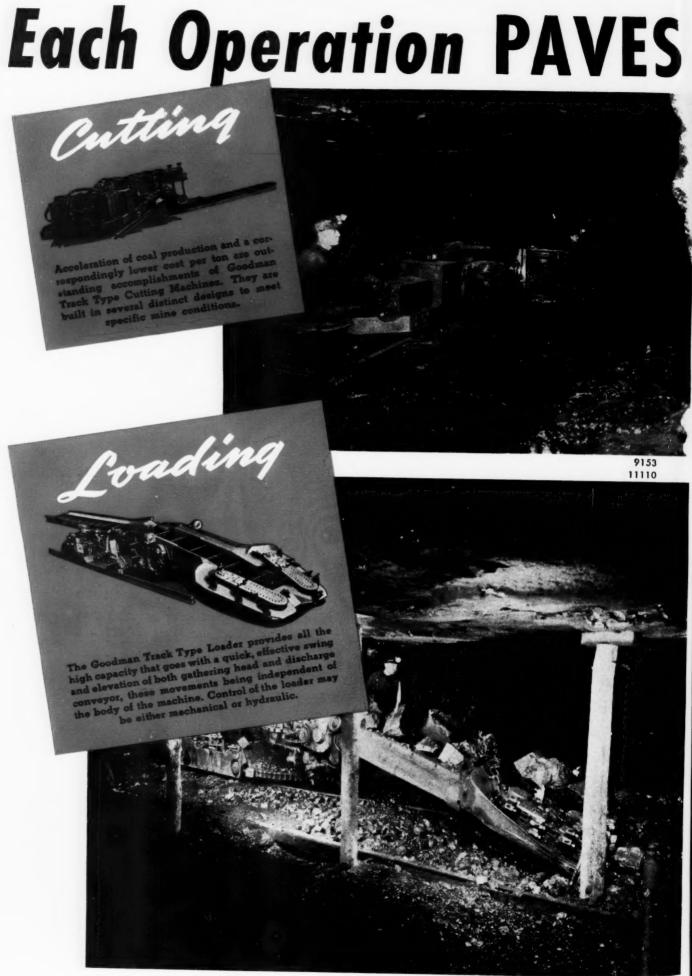
THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO



Timken Bearing Equipped mine cars at Kathleen Mine, Union Colliery Company.

Manufacturers of TIMKEN Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; TIMKEN Alloy Steels and Carbon and Alloy Seamless Tubing; and TIMKEN Rock Bits.

TIMKEN TAPERED ROLLER BEARINGS



## ES THE WAY for the Next

ASSURING SPEED - TONNAGE - LOW COST

● Every step in coal mining can be helped or hindered by the operations which precede it—can help or hinder those that follow. Goodman Track Mounted Equipment takes this principle into account—gives you three operations better performed because each paves the way for the next. With such a system the same track serves the coal cutter, the loader and the locomotive, each machine

benefiting by a convenience which assures the greatest efficiency with substantial, speedy and easily controlled track mounted units.

When planning future equipment selections consult Goodman for a detailed consideration of your cutting, loading and haulage problems.

Goodman Manufacturing Company Halsted Street at 48th, Chicago, Ill.

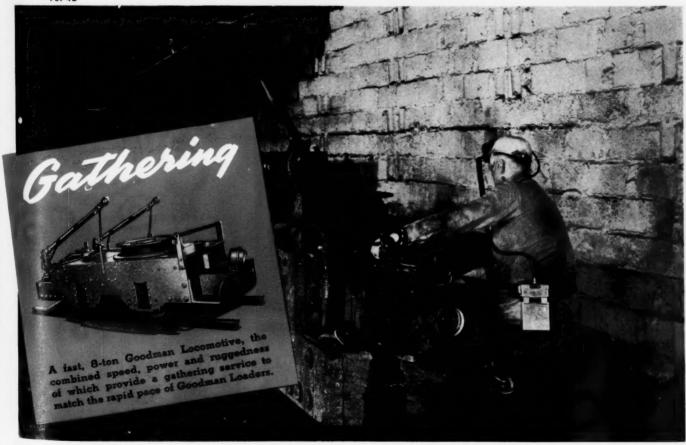
With

## GOODAAA Track Mounted Equipment

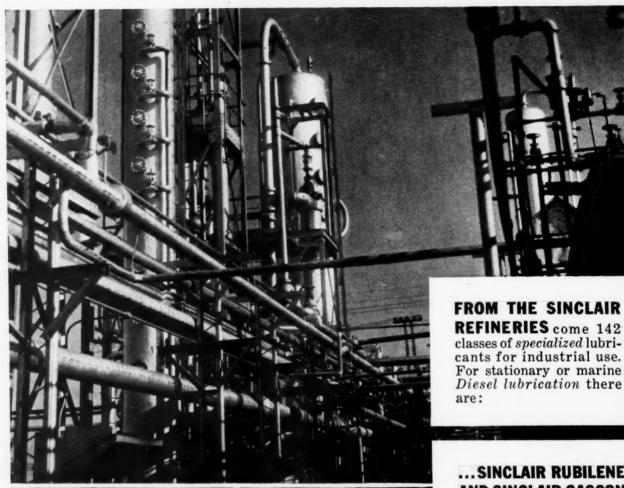
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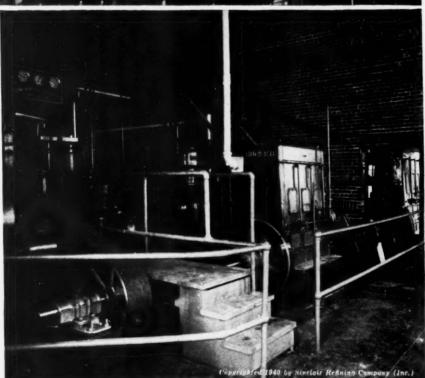
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No. 10



October, 1940 - COAL AGE





#### ... SINCLAIR RUBILENE AND SINCLAIR GASCON

OILS - special Diesel oils that offer protection against sludge, scoring, and stuck rings. They provide maximum operating efficiency at minimum operating cost.

Sinclair engineers will confer with you on any Diesel lubricating problem. Simply write your nearest Sinclair office or Sinclair Refining Company, 630 Fifth Avenue, New York, N.Y.

BUCKEYE DIESELS and YORK ICE MACHINES of Sanford Ice & Coal Co., Sanford, N.C. J. T. Salmon, Jr., Vice-President, says Sinclair oils have "out-performed all others, even those at higher prices."

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SINCLAIR REFINING COMPANY (Inc.)

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# AMERICA'S FAVORITE WASHER is the Favorite in Southern Illinois

APPROXIMATELY 45%
OF ALL COAL WASHED IN
SOUTHERN ILLINOIS IS
WASHED BY MCNALLY-NORTONS

In the seven counties of the Southern Illinois District featured editorially in this issue, McNally-Nortons clean 3100-t.p.h., or over 45% of the total installed washing capacity. The balance is washed by eight other systems. Such a showing is a positive indication that America's favorite coal washer is also the favorite in the Southern Illinois District. Its clean-cut separation, uniform output of a predetermined ash content, trouble-free operation, and low operating cost have been responsible for its everincreasing popularity. Write for full information on this remarkable washer. TRUAX-TRAER

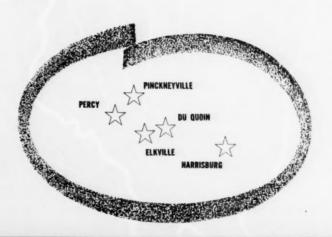
SOUTHWESTERN 750 T.P.H.

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PEABODY 200 T.P.H.

> SAHARA 750 T.P.H.





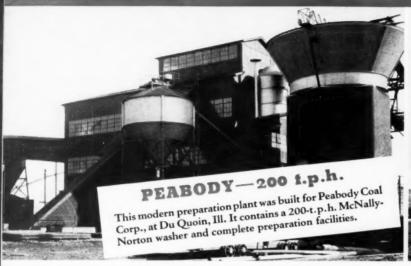
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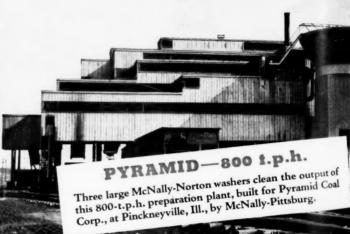
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AUTOMATIC WASHER

A McNally-Pittsburg Product

# Southern Illinois Cleaning Plants DESIGNED, MANUFACTURED, and ERECTED by McNally-Pittsburg











#### Also a Complete Line of Preparation Equipment

In addition to complete plants, McNally-Pittsburg also offers a line of coal preparation equipment, including single roll and double roll crushers, stoker coal crushers, pick breakers, dryers, rotary dumps, shaker screens, conveyors, and other preparation accessories. Write for a quotation.

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#### MCNALLY-PITTSBURG MFG. CORP.

SPECIALISTS IN COAL PREPARATION

General Sales Office, 307 N. Michigan Ave., Chicago, Main Office and Works, Pittsburg, Kansas



#### What Makes the Rubber Jacket so TOUGH?

Tension Stripping Shovels

HAZACORD CABLES — dense, strong, tough, lasting — stand abuse that would quickly destroy a less well-made cable . . . WHY?

Because the rubber jackets that furnish Hazacord protection contain over 60% of the finest crude rubber combined expertly with toughen-

ing agents and are vulcanized under heavy pressure in a continuous metal mold. » » Hazacord Cables will take bruising blows. You can pull them around sharp rock or coal edges, over switch latches, through mud and water and they will come up ready for more punishment.

Write for catalog and full information.

#### HAZARD INSULATED WIRE WORKS

DIVISION OF THE OKONITE CO.

New York Chicago Philadelphia Atlanta
Dallas Washington Cleveland



Pittsburgh Buffalo Boston Detroit Seattle
- San Francisco St. Louis Los Angeles



WALTER MOTOR TRUCK CO.



for MAmerica's Mining Industry

The Hazard Wire Rope Division manufactures wire rope of all

Ninety-four years is a long time. Ninety-four years of wire rope making is a lot of experi-

types, wire rope attachments, fittings and slings. Ever since Elisha Hazard started making wire rope back in 1846, we have devoted our engineering research, field training and production facilities to the end that Hazard ropes shall serve the users at ever lower cost. Many of the important developments and improvements to wire rope have been Hazard's.

Ninety-four years is a long time. Ninety-four years of wire rope making is a lot of experience. A product has to be good to maintain its name through three generations. It has to be good to keep customers coming back for Hazard rope continuously for 30, 40 and 50 years. A product has to be good to merit such loyalty—and we find real pride in the fact that it was in the mining industry where loyalty to Hazard first developed.

The Green Strand Identifies Hazard Wire Ropes made of Improved Plow Steel

HAZARD WIRE ROPE DIVISION • Established 1846 • WILKES-BARRE, PENNSYLVANIA DISTRICT OFFICES: New York, Chicago, Philadelphia, Pittsburgh, Fort Worth, San Francisco, Denver, Los Angeles, Atlanta, Tacoma

AMERICAN CHAIN & CABLE COMPANY, Inc.

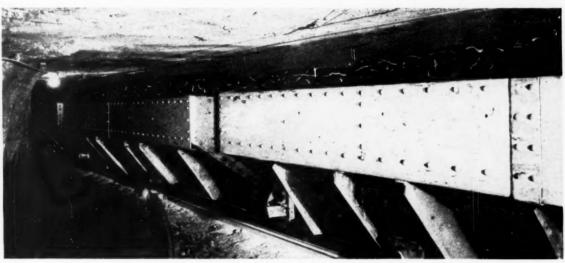
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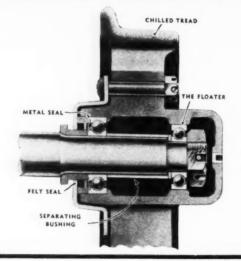
#### • This simple of thousands

In coal fields everywhere, now more type of S-D "Automatic" transportation and equipment making money for hundred quip of operators. In the Illinois field, every effortype of S-D Automatic equipment is a Autoperation: S-D "Floater" Ball Bearing Wheels . . "Automatic" bottom discharge cars, 3 to 12 ton capacities, an "Automatic" rubber-tired bottom discharge trailers, 3 to 5 ton capacities used in underground service . . . Eight wheel, "Automatic" bottom discharge cars, capacities to 16 tons, and "Automatic" rubber-tired bottom discharge trailers, capacities to 20 tons, used in strip mining.

In the near future, dozens of other or erators will install S-D "Automatic" car my or trailers. We know this because par ars performance proves that any mine wi ew show a much greater profit with S-I and "Automatic" equipment than with an other type. Any operator will uncover



Shown at left is the 12 ton S-D "Automatic" bottom discharge car in the Buckhorn mine of The Consolidated Coal Co.



Thousands of Sanford-Day Wheels are in daily use in Illinois, and many of them have been operating for over 20 years. Shown at left is the S-D "Floater" Ball Bearing Wheel. In one of the large mines, over 600 "Floaters have been running for over 5 years without regreasing an without a single failure. Here's a wheel that's guarantee for 5 years against undue wear or breakage . . . a wheel that shows, through independent engineering tests, power savings of 14 to 33% over wheels with other types of precision bearings. And, if you have to grease it more that once in 5 years, we guarantee to pay the extra cost. Write for our free trial truck offer.

#### SANFORD-DAY IRON WORKS

MINE CARS, ALL TYPES

WHEEL

#### plemorandum can start savings ndof dollars in your mine!

now more type carnest, and he will realize that he unto the well afford to do without this number of the portation of the por

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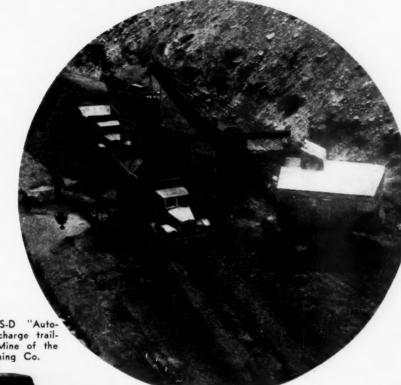
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nore tha ost. Writ

WHEEL

10

Shown at right—S-D "Auto-matic" bottom discharge trailers at the Delta Mine of the Delta Coal Mining Co.







S.D UNDERGROUND RUBBER TIRED TRAILER; the type used in the Blue Bird Coal Company's mine, Carrier Mills, Illinois.

During the past 4 years, we have worked out an unusually successful and economical system for underground transfer of coal, using 10-ton bottom discharge cars. In solving your own problem you can have the benefits of our experience for the asking. Simply drop us a line.

#### RKSInc. Knoxville, Tenn.

SHEAVES

**TRAILERS** 

Here's a trailer that's simple, foolproof and automatic. A trailer that practically eliminates maintenance cost . . . built sturdy to take the punching . . . doors trip automatically as the trailer reaches the hopper . . . close automatically as the trailer moves across the hopper . . . no manual labor whatsoever. S-D Trailers eliminate stop-andstart discharge time and labor, and their low center of gravity provides maximum capacity and fast, easy manipulation.

#### MAIL THIS MEMO NOW

Send me complete informat	ion on—		
S-D "Floater" Wheels Mine Car Rental Plan	S-D Tra	ilers 🗆 S-D	"Automatics"
Name			
Title			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Firm			

PRODUCTION TON WOL starts



# A. V. C. MINING CABLE THE ORIGINAL

H COM

• If you don't know what a better mining cable can do toward increasing production and reducing costs ... ask them what they think about Rockbestos A.V.C. Mining Cable in the mines of Southern Illinois.

Up there where men and machines are rolling up tremendous tonnage records they depend on high-speed mechanized operation to knock production costs down to rock-bottom; high-speed cutting, loading and hauling ... speed without cost-increasing breakdowns ... and their equipment stands up under the hot pace because it's wired with Rockbestos A.V.C., a cable that's as heatproof as fireclay and as fireproof as a chunk of slate.

Resistance to heat, overloads, vibration, oil, grease, moisture, alkalies, and even fire, was designed into Rockbestos A.V.C. Mining Cable when we originated and developed it for the internal wiring of mining machinery back in 1928. A felted asbestos wall over the conductor provides protection against copper-heating overloads, over that we wrap varnished cambric for high dielectric strength and moisture resistance, then another wall of felted asbestos which seals the varnished cambric against heat, and over all a thick, rugged asbestos braid impregnated with heat, flame and moisture resisting compounds. It won't dry out and crack because asbestos is heatproof ... it won't burn because asbestos is fireproof ... and it won't rot, bloom or swell because asbestos is unaffected by oil or grease.

Use Rockbestos A.V.C. when you rewire your cutters, loaders and locomotives and you'll be able to run them longer and harder at a lower cost per ton. That's why manufacturers use it in their equipment and big operators standardize on it for rewiring. For samples and tables giving sizes and diameters, write to Rockbestos Products Corporation, P. O. Drawer 1102, New Haven, Conn.

It comes in blue-wrapped coils or white-lettered gray reels, bearing the hour-glass trade mark.

Order from these jobbers—Specify "ROCKBESTOS A.V.C."

BECKLEY W. VA.: Beckley Mach. & Electric Co. BIRMINGHAM, ALA.: Moore-Handley Hardware Co. GLEFELD W VA.: Superior-Sterling Co. EVANSVILLE, IND.: Evansville Electric & EAIRMONT, W. VA.: Fairmont Supply Co.

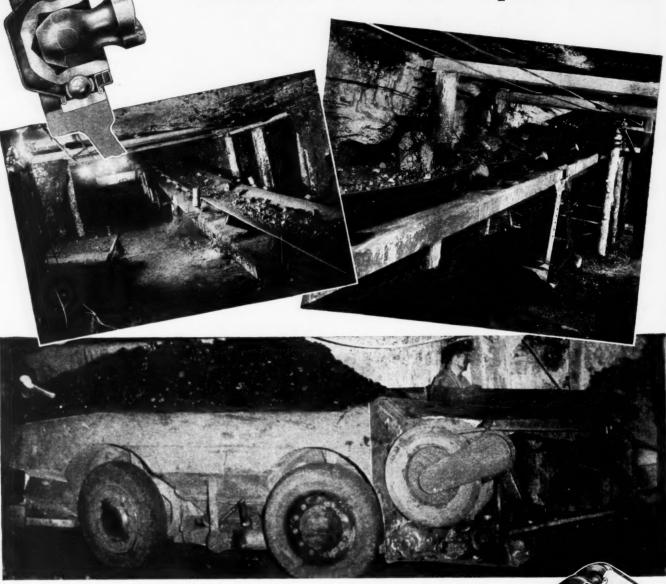
HUNTINGTON, W. VA.: Bankı-Miller Supply Co.
LOTHAIR, KY.: Mine Service Co.
MIDDLEBORO, KY.: Rogan & Rogan Co.
PITSBURGH PA.: Upson-Walfon Co.
SCRANTON, PA.: Penn Electric Engineering Co.
WILLIAMSON, W. VA.: Williamson Supply Co.





Colhe wire with pennenen

Self-Sealed for Long Life and low cost operation



• Years of service in mechanized mine equipment have now proved conclusively that the many types of New Departure Self-Sealed ball bearings definitely reduce operating costs.

In Conveyors, Shuttle Cars, Loading Machines, Mine Cars and other machinery, the maintenance-free operation of these long-lived, easy-running bearings has helped to step up production and bring the cost per ton down. New Departure, a Division of General Motors, Bristol, Connecticut.

#### **NEW DEPARTURE**

PIONEER OF THE SELF-SEALED BEARING



to provide more coal per face for the loadthe coal forward, longer cutter bars can be used

CARDOX is much more than a centage of premium-sized coal. It's the answer to the modern problem means of increasing a mine's perof how to get the most out of mechanical mining equipment under a wide variety of conditions.

When CARDOX and mechanizago down. First, CARDOX permits viding more coal per face for the loading machine. Next, its heaving tion are teamed up, production costs the use of a longer cutter bar...prorolls the coal forward in a loose pile of coarse sizes that permits much faster loading ... reduces wear and action shears the rib and top clean, tear on the loading machine.

As there are no smoke or fumes with the CARDOX mining method, the crew can enter a working face immediately after the fall. And, benated, and less impurities mixed with cause shatter-cracks are elimithe coal, preparation costs are lowered while realization is increased.

nage, safety and realization are not Furthermore, CARDOX gives positive protection against overshooting and tight cuts. Increases in tondependent upon the judgment or experience of the worker.

ECONOMIES ... SURVEY AND PRACTICAL TEST CARDOX PRODUCTION EFFICIENCIES AND WRITE TODAY FOR FULL FACTS ON ARRANGED without obligation.

BELL BUILDING . . . CHICAGO





## PIONEERS IN PIONEERS IN MECHANIZATION

Pioneers were the Southern Illinois miners who sent their flat boats of Illinois coal down the Father of Waters to New Orleans in 1810. And pioneers today are Southern Illinois mine operators in their progressive outlook toward complete mechanization. Old Ben, Kathleen and Majestic; New Orient, Harco and Harrisburg—among the foremost mechanized coal mines in America are these and many another famous mine in Southern Illinois.

Throughout the entire Southern Illinois district, as in other fully mechanized mines the country over, operators long ago discovered the necessity for really sturdy mine track equipment to carry the load of mechanization. For even where mechanical cutters and loaders are not track-borne, the faster pace made possible by mechanization throws an extra-heavy burden on the entire haulage system. Rugged, durable trackwork is essential to smooth, profitable production.

Operators of many mechanized mines have found the solution of their haulage problems in Bethlehem Heavy-Duty Mine Track Equipment. For Bethlehem pioneered in producing heavy-duty mine track in anticipation of developing needs. And years of use in mines the country over have proved the outstanding merit of Bethlehem Heavy-Duty Mine Track Equipment for the mechanized mine.



A TYPICAL INSTALLATION OF BETHLEHEN

BETHLEHEM PARALLEL-THROW SWITCH STANDS were specially designed to combine maxi-

were specially designed to combine maximum ruggedness and simplicity with minimum height. There are only three sturdy moving parts. All are above the tie for easy maintenance and freedom from clogging.





OMPLETE TURNOUT AND PARALLEL-THROW SWITCH STAND IN A SOUTHERN ILLINOIS MINE

BETHLEHEM HEAVY-DUTY SWITCHES are half again as heavy as conventional types and long outlast them, yet a complete Bethlehem turnout, mounted on steel ties, has been installed in only two-and-half man hours.

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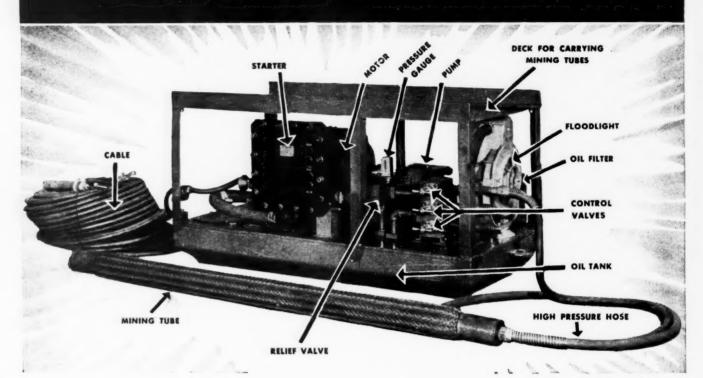
**BETHLEHEM SOLID-TYPE FROGS** outwear ordinary types because they are cast of tough, work-hardening manganese steel which actually builds up resistance under rolling equipment. There are no plates or rivets to work loose.

BETHLEHEM STEEL TIES save installation time. Tie automatically gages track and a single blow on the clip locks tie and rail rigidly together. No rotting, or spike-killing and steel ties can be relaid again and again.

BETHLEHEM STEEL COMPANY

#### The "lump" season is here!...The

## The DUPONT HYDRAULIC



#### **NEWLY-DESIGNED PUMPING UNITS NOW AVAILABLE**

### Compact-Broad Utility-Low Cost

IN THE Du Pont Hydraulic Mining Process an expansible mining tube is placed in a drill hole of an undercut coal face. Oil is pumped into the tube. The tube expands and breaks the coal free along its natural parting lines.

The result is more lump, larger lump, and firmer lump...and the lump does not disintegrate in handling or storage.

The pumping unit illustrated above is 60 inches long, 30 inches wide and 26 inches high to the tube-carrying deck. It weighs approximately 2000 pounds,

including cable and 3 mining tubes. All equipment is explosion-proof.

This skid-type unit was designed primarily to remain in rooms for use with conveyer or other trackless mining systems. It can be readily advanced in the room by a cutting machine cable.

In mines that have propelling means available, it can be mounted and moved from room to room.

Its cost is but a fraction of self-propelled permissible pumping units.

#### method of producing lump is here!

## MINING PROCESS \* \* \* \*



## The Du Pont Hydraulic Mining Process is also the SAFEST method of breaking down coal

- I. NO FUMES OR SMOKE
- 2. NO FLYING ROCKS, COAL OR SHELLS
- 3. NOTHING TO IGNITE GAS OR DUST

To INCREASE profits, two Colorado coal companies sought larger, firmer lump. They installed the Du Pont Hydraulic Mining Process and in each case they got the profitable lump they wanted. The size and character of the lump is shown in the photo above, which illustrates a loaded car of lump coal prepared by Du Pont Hydraulic Mining Process. Note size of lump coal.

#### Send for Illustrated Book!

Du Pont has prepared a new book which describes and illustrates the advantages of the Du Pont Hydraulie Mining Process. This book is free, Simply write to the address below.



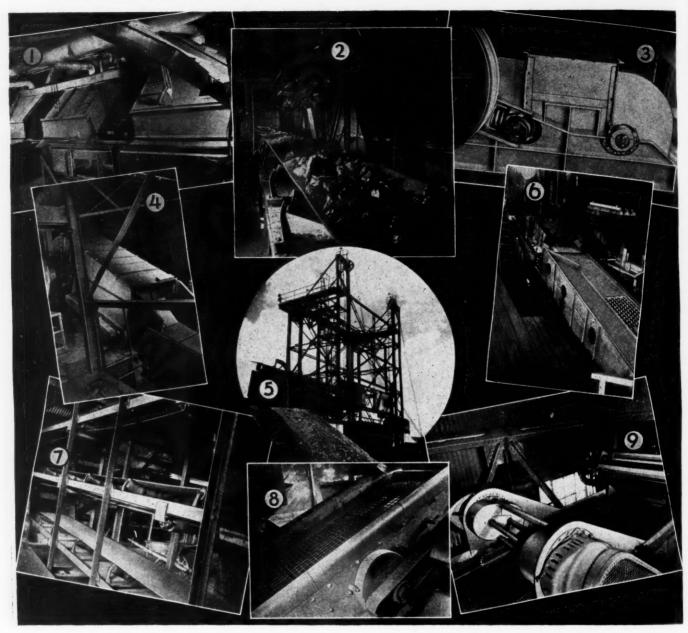
#### E. I. DU PONT DE NEMOURS & COMPANY, (INC.)

Explosives Department,

Wilmington, Delaware

Tune in "Cavalcade of America"... NBC Red Network... every Wednesday evening





- 1. Battery of 6' x 14' Gyrex Screens equipped with dust tight enclosures.
- 2. 42" Belt Conveyor bandling run-of-mine coal.
- 3. Double roll, chain driven Crusher making stoker coal.
- Primary Scalping Grizzly Screen bandling large lump.
   Track Level Car Dumper in one of America's largest preparation plants.
- 6. Double deck, vibrating Distributing Chute. Coal may be picked in transit.
- 7. Three deck group of Belt Conveyors for mixing.
- 8. Typical Gyrex Sizing Screen.
- 9. Eliptex Horizontal Screen for use where head room is limited.

#### 13 OUT OF 18 PLANTS DESCRIBED IN THIS ISSUE USE ROBINS EQUIPMENT

Send for information of products of interest to you.

ROBINS CONVEYING BELT CO. PASSAIC, NEW JERSEY

Offices in principal cities



#### In Southern Illinois, Too-

It's Simplex Jacks for Safety!

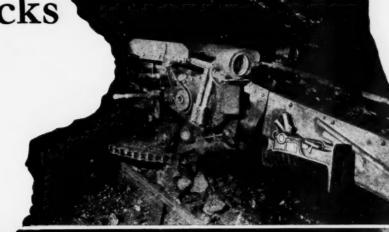
Alert operators in Southern Illinois, as in other fields, have learned to depend on Simplex Jacks for speed, ease of operation and safety. They know that Simplex engineers have spent many years studying mining methods and know what miners want and need to get coal out. They know that Simplex Jacks alone have the safety features that won them the Gold Medal Award for Safety.

Simplex Jacks have the toughness to resist abusive handling and strength to lift large loads combined with light weight for ease of handling and carrying. There's a Simplex Mine Jack for every purpose - for trackwork, rerailing mine cars and locomotives; for coal cutting and loading machines; and for cross-timbering, roof supporting, post pulling, cable tensioning, wheel pulling and many other jacks for operation and maintenance every one with exclusive operating and safety features.

Sold by your supply house.

TEMPLETON, KENLY & CO. Chicago, Ill.

Better, Safer Mine Jacks Since 1899





Top—Two No. 22 10ton jacks, one on each side of this loader, within easy reach, increase manpower, save time, protect workers.

Center—No. 85-A easily lifts 5 tons 10' on cap or toe, speeds main track laying in this Southern Illinois mine; 84-A is for thinner seams; 86-A for thick seam work

Bottom—No. 101: 10-ton jack with speed trigger get lots of use and is kep in easy reach on this slabbing machine.



SIMPLEX Jacks

Awarded the Gold Medal for Safety



# Striface Sectage.

BARBER-GREENE'S ingenuity, engineering skill, and experience are saving money for many of the biggest names in coal. Barber-Greene Conveyors and Stackers have reduced surface storage costs to a negligible figure. Barber-Greene's standardized sectional construction has given a new flexibility of setup to underground conveying systems.

The many Barber-Greene installations include the Southern Illinois fields reviewed in this issue of Coal Age.

We maintain a department for the sole purpose of giving you the most economical solution to your particular coal handling problems. Phone, write or wire—there is no obligation.

Write for your copy of the new Barber-Greene Mine Conveying Bulletin 676.

40-11

Inderground Conveying!

BARBER



GREENE

THE NEEL HOUR

Production!
Gpeed-up!

(See other side)



10,000 BALL BEARINGS

## ..."taking chances" was banished in this plant by switching to TYCOL GREEN CAST GREASE

With this food plant, lubrication is a matter of the greatest importance and must be given a great deal of thought and care. That is why TYCOL GREEN CAST GREASE has been used for lubrication throughout the plant for the last 2 years. » » In order to manufacture 850,000 lbs. of crackers and biscuits a week, shutdowns of even a short period during the day cannot be tolerated. If a bearing should heat up and cause a stop it would cost \$2.00 per minute, so it is essential that a dependable grease be used. " There are over 10,000 ball bearings throughout the plant. During the past two years there have been only 11/2 hours delay in production . . . a lubrication job of which Tide Water is justly proud. » » » This plant has found that by holding down lost production to an absolute minimum, waste can be avoided. This can only be done by having the right kind of grease. Plant shutdowns cost you money. Don't take chances when you can be sure of the correct Tycol Grease or Oil "scientifically engineered to fit your needs." The experienced services of Tide Water En-

TIDE WATER ASSOCIATED OIL COMPANY gineers are at your disposal.

Regional Offices: Boston, Philadelphia, Pittsburgh, Charlotte, N. C.



TIDE WATER REEN CAST GREASES

#### Here goes Another AMERICAN ROLLING RING COAL CRUSHER into Service in Southern Illinois

This installation is being made at the New Orient preparation plant of Chicago, Wilmington & Franklin Coal Company where several of these crushers are in service.

#### Other SOUTHERN ILLINOIS installations.

At Old Ben Coal Corporation an American in use in the preparation

At Franklin County Coal Company's Royalton No. 7 Mine an American is used for breaking down hand pickings and in the new coal-cleaning plant an American AC-3 crusher is in use.

There's an American in service at Peabody Coal Company's Mine No. 18.

Two Americans are serving at the Fidelity No. 11 Mine operated by United Electric Coal Company.

A number 30-S American is installed at the Southwestern Illinois Coal Corporation's Streamline Mine.

This patented Reversible Manganese Steel Shredder Ring is the big feature of operation that makes it possible for you to save more money.



#### The patented reversible Manganese Steel Shredder

Ring Found only in the American Rolling Ring Crusher, the Reversible Manganese Steel Shredder Ring Crusher assures uniform size of coal by the SPLITTING of the coal. An adjustable grinding plate makes it possible to secure properly sized coal to meet the demands of the consumer. Crusher can be adjusted to make either a maximum or minimum amount of fines,

#### You Get These Benefits

- 1. Its dependable operation saves on maintenance.
- 2. The splitting action of our patented Manganese Steel Shredder Rings reduces fines to a minimum—the coal in split intead of being crushed.
- 3. Another result of this splitting action is a reduction of power requirements to a remarkably low figure.
- 4. It costs you less than one cent a ton, including all costs, to reduce bituminous coal from lump to stoker size.
- Simplicity of construction and operation—accessibility at all times, and real flexibility on the job all point to economy for you.

WRITE FOR COMPLETE DETAILS



American Rolling Ring Coal Crusher, Type AC-3 in service at Buckhorn Mine, Consoli-dated Coal Co.

American Laboratory Sample Crusher driven by a 2 h. p. motor at Burning Star prepa-ration plant operated by Truax-Traer Coal Company.

There is an American Laboratory Crusher at Consolidated Coal Company's Jefferson Mine and one at Bankston Creek Collieries.

The American ROLLING RING COAL

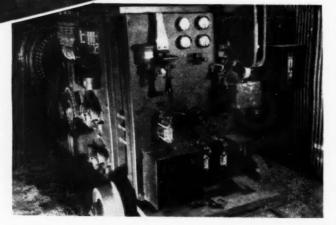
1119 MACKLIND AVENUE AMERICAN PULVERIZER COMPANY ST. LOUIS, MISSOURI CRUSHERS AND PULVERIZERS

# SOUTHERN ILLINOIS FOR INCREASED

# THESE G-E PRODUCTS ARE TONNAGE BOOSTERS IN SOUTHERN ILLINOIS

HIGH-SPEED ELECTRIC HOISTS mean more tons raised to the surface per hour. This G-E 1350-hp dc motor is driving a hoist at Valier Mine of Valier Coal Company. G-E motors and control, backed by the experience of G-E engineers in applying them to hoist service, enable you to meet the requirements of fast, smooth, dependable operation at a point that may be the bottleneck of the entire mine.

G-E CAPACITORS improve power-factor and voltage on a-c circuits and so make possible important operating benefits—improved starting conditions, prevention of unnecessary shutdowns, and sometimes remarkable reductions in power cost. This installation is at the Valier Mine of the Valier Coal Company.



G-E PORTABLE SUBSTATION EQUIPMENT, mounted on wheels for moving on the tracks, can be easily kept near the load center to maintain voltage at the face and thereby enable the d-c equipment to operate at normal speed. This 150-kw portable substation is in the Kathleen Mine of the Union Colliery Company. View shows the switchgear truck.

SOUTHERN ILLINOIS is ready because for years it has been modernizing and mechanizing—and placing its reliance largely on G-E equipment and engineering for the solution of its electrical problems.

As a result, operators in this area have taken long steps toward the elimination of bottle-necks in moving the coal, toward the reduction of shutdowns for repairs and maintenance, and to speed up operations generally.

Today, you find thousands of G-E motors in service here, helping through their outstanding dependability to maintain continuous operation—underground, in the open-pit fields, and in preparation plants—and thereby to help assure low-cost production. You find, in addition, many other types of G-E equipment—practically a complete electrical line for mining service.

Shown here are just a few of the many General Electric installations in Southern Illinois. Have our local representative look over your requirements with a view to increasing production and lowering costs. General Electric, Schenectady, N. Y.

# MINES ARE READY PRODUCTION AT LOW COST! ARE YOU?

Modern Electric Equipment
May Cost You Nothing because of What It Can Save

G-E LOCOMOTIVES keep the coal moving because they're built to withstand hard use. This new, 20-ton main-line locomotive in the New Orient Mine of the Chicago, Wilmington & Franklin Coal Company is no exception. It's one of 85 G-E locomotives that are serving this company.

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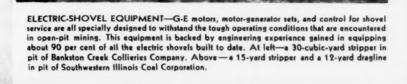
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GENERAL & ELECTRIC

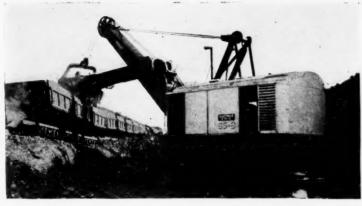
#### SERVING LEADING STRIP



Modern Bucyrus-Eries are cutting costs and increasing production throughout the open pit mines of Southern Illinois, as well as of the entire coal mining industry. Behind the outstanding field performance of these years ahead machines lies thorough analysis of the duty to be performed. Strippers, loading shovels, utility draglines and clamshells, blast hole drills, scrapers, bullgraders and bulldozers...the job each of these must do is scientifically studied, and each machine designed and built to DO that job at lowest unit cost. We're proud that the experience and size of our engineering staff and manufacturing organization enable us to make changes in design and construction whenever such changes mean lower costs and increased production for you. A consistent policy of open-minded progress in the light of the best experience cannot but be reflected in the field performance of Bucyrus-Erie equipment.

Bucyrus · Erie

#### MINES IN Southern Illinois



Carrying a 5-yard coal dipper, the 85-B has proved a popular loading shovel. The machine above is owned by Pyramid Coal Corporation, loads coal uncovered by a 950-B at No. 1 Mine.



At Truax-Traer's Burning Star mine, two 9-yard Bucyrus-Erie scrapers help out with the stripping. These scrapers range in size from 6 to 13yard struck capacities.



Here are four 29-T blast hole drills owned by Southwestern Illinois Coal Company. Medium-sized drill in the Bucyrus-Erie line, the 29-T swings 3,000 lbs. of tools, has made big drilling savings through the use of 9-inch holes.



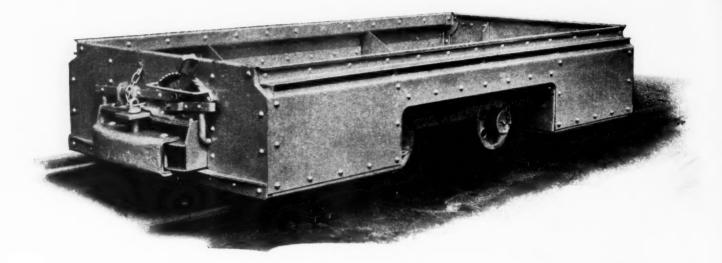
The 950-B is the most popular of big strippers. Here is a close-up of Sahara Coal Company's "30-yard-er," with the two Bucyrus-Erie bullgraders.

This fleet of Bucyrus-Eries mines "Sahara Six" near Harrisburg, Illinois. A 6-yard 100-B loads coal uncovered by a 30-yard 950-B. Two Bucyrus-Erie bullgraders are "cleanup" men. Eight 29-T's drill the overburden and a 37-B dragline handles drainage, etc.



October, 1940 - COAL AGE

## Build for lightness-strength-durability



## with MAYARI 18

The natural qualities of Mayari R make this low-alloy high-tensile steel the outstanding economical choice for many products. Mayari R is strong for the hard jobs. It reduces weight. It is tough enough to withstand impact and abrasion. It is durable—has extra resistance to corrosion.

Mayari R is suitable for new construction, replacement and repairs. It meets modern requirements of light weight construction without loss of strength or sacrifice of safety, while contributing long service and low maintenance cost.

#### Mayari R means no change in shop practice

The regular shop crew will handle Mayari R like mild carbon steel and hardly know the difference—just minor allowances for the greater strength of Mayari R. It welds readily by the usual gas and electric methods—does

not air-harden. It is used "as rolled" because it has full physical properties just as it comes from the mill and needs no heat-treatment.

#### Available in usual forms

Mayari R is available as sheets, strip, structural shapes, plates, bars, rivets and cold formed sections.

#### Low costs

The appreciable saving in weight with Mayari R renders the finished-job cost practically equal to that of ordinary steel, with advantages of reduced deadweight, increased payload capacity, longer life, reduced maintenance and longer spread of investment.

#### Catalog on request

A catalog describing Mayari R will be sent on request.

BETHLEHEM STEEL COMPANY



## To Retiro Obsóloto Loaders!



On't let obsolete loading machines hamper your mechanical production!

The modern, up-to-date Whaley Automat Coal Loading Machines (available now with Two-Speed Tramming) with decided advantages in high capacity, low maintenance and great safety to operators, pay for themselves in a short period of time.

Figure the advantages, the economies and better operation of these up-to-date machines against the cost of replacing obsolete loaders and let us show you what can be done to cut the costs in your mines.

Only the Whaley Automat holds ALL FIVE cost cutting factors at rock bottom levels to insure lower overall costs.

Let us show you what the "BIG 5" advantages mean for cost cutting. Send in the coupon!

#### MYERS-WHALEY CO., INC.

Knoxville, Tenn.

"Pioneers of Lower Cost Loading Since 1908"

# The New Whaley Automats are Streamlined to give you . . .

- • MAXIMUM CAPACITY averaging 3 tons per min. (maximum 7).
- LOWEST UPKEEP COST due to simplicity of construction, ruggedness and accessibility of all renewable parts.
- MINIMUM DEGRADATION insured by the inherent, exclusive, patented shoveling principle available in no other loader.
- GREATEST SAFETY to operators. The vertical shoveling action keeps the whole machine stable throughout the entire loading cycle.
- LOWEST POWER COSTS. Think of it! The one 25 h.p. motor consumes only 1/5 k.w.h. per ton loαded.



#### CUMMINS Dependable DIESELS

# DOING A BETTER JOB CHEAPER

• Throughout the coal mining industry, Cummins Diesel power has increased tonnage, lowered the cost per ton. Whether applied to stripping, ventilating, preparation, haulage, cutting or loading, Cummins Diesel power has demonstrated that it is doing a better job...doing it cheaper.

The dependability of the Cummins Diesel assures steady power in the tipple or at the cutting face . . . costly down-time for service or maintenance is reduced to a minimum. In generating service, the fuel and maintenance economy, the instant starting of the Cummins Diesel produces electric power for less than one cent per KWH . . . eliminates fixed charges for standby service. The Cummins Diesel is rugged, flexible and has the high torque needed to withstand the severe shock loads of stripping operations . . . the power "holds on" no matter how tough the digging. Cummins Diesel-powered trucks have extra "power at the wheels," climb out of the pit in one or two gears higher . . . your assurance of more loads per hour, more tons per load.

All along the line, Cummins Diesel power will mine and move your coal faster and cheaper. Complete operating data on every type of job upon request. Cummins Engine Co., 4416 Wilson Street, Columbus, Indiana.

Late news from the coal fields: United Electric Coal Co., Chicago, orders 13 new Autocars powered with supercharged, 200 hp. Cummins Diesels . . . Southwest Coal Co., Percy, III., buys 10 supercharged, 200 hp. Cummins Diesels for replacement service in FC Macks.

Right: A Cummins Dependable Diesel powers the 3 ½-yd. Monighan Walking Dragline operated by the Briggs Coal Co., Carbon, Ind. Owner says: "It never hesitates on a hard pull and we've never killed the engine . . . takes five seconds to start."

Below: Central States Collieries, Inc., operates a Cummins Diesel-powered Plymouth switching locomotive at St. David, III. Engineer says, "Cummins Diesel much handier and cheaper than steam."



A COMPLE



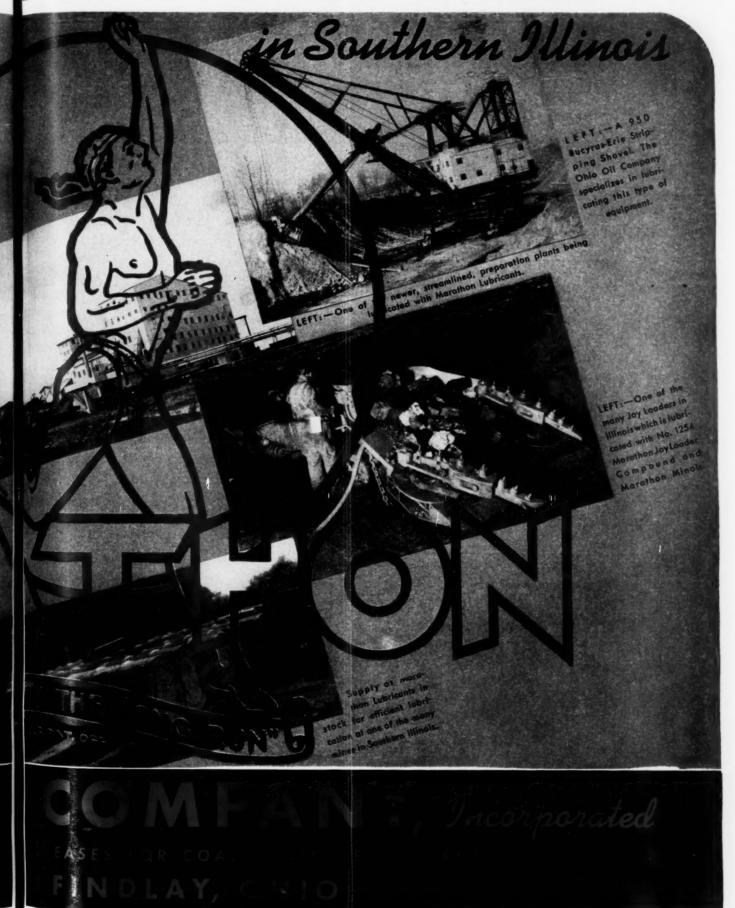
"PRESCRIBED"



THE OHIO OI

GENERAL OFFICE

## FOR MODEL MINES...

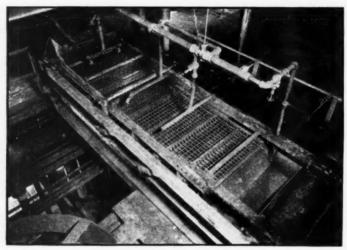


October, 1940 - COAL AGE

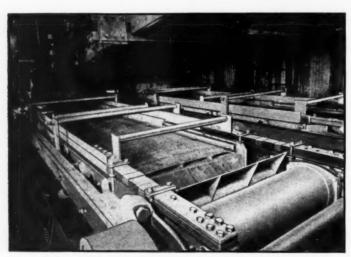
#### NORDBERG HOISTS and SCREENS



CHICAGO, WILMINGTON & FRANKLIN COAL CO.
West Frankfort, III.
The world's greatest capacity coal hoist.



BELL and ZOLLER COAL & MINING CO., Ziegler, III. A 42" x 10' Nordberg Coal Sizing Screen.



FRANKLIN COUNTY COAL CORP., Royalton, III. Two 4 x 14 foot Nordberg Dedusting Screens.

#### SOUTHERN ILLINOIS

In Southern Illinois, as in most mining areas, equipment built by Nordberg plays an important part in the operations of hoisting and screening. Here will be found the world's record for coal hoisting. It is held by a 12 x 17 foot diameter, cylindro-conical drum hoist driven by two 2000 horsepower motors and at each trip lifts 13 tons of coal a distance of 607 feet in 17 seconds. Over 15,000 tons have been hoisted from a single shaft in an eight hour day which far surpasses the performance of any hoist engaged in the hoisting of coal. Almost a score of Nordberg Hoists are serving other mining operations in the Southern Illinois field.

In many of the newer preparation plants, Nordberg too is aiding in the production of better quality coal. The horizontal Symons Screen with its unusual action is particularly suited for making stoker and other specially sized coals for which there is a constantly growing demand. Whether it is for sizing, dedusting or dewatering, there is a Symons Screen that does the job most efficiently and produces premium quality coals for which there is a more ready market. If you are interested in better screening at lower cost, investigate the merits of the horizontal Symons Screen.

NORDBERG MFG. CO. WISCONSIN

### The Car that Sweeps Itself Clean

-with a hand from the G.T.M.



GOODYEAR RUBBER UNLOADING APRON
for zinc ore mine cars

RUBBER APRON

ere you see how a bottleneck in a large zinc mine was broken, through an ingenious application of rubber by the G. T. M. — Goodyear Technical Man. Dump cars that wouldn't dump were the trouble. Wet, soggy ore was the reason. Ore stuck so tenaciously inside the cars, particularly in the lower back corner, that a third or more of every load had to be laboriously scraped out by hand — a slow costly operation. Since wet ore does not adhere to rubber, the

G. T. M.'s answer to this sticker was to line the back of the cars with an apron of tough, smooth

Goodyear Armadillo rubber-sheeting, firmly clamped at the top, free to swing at the bottom. Now, when a car dumps, the rubber apron swings forward, sweeping the ore before it and emptying the load in a jiffy. This installation is typical of scores of new uses of rubber developed by the G. T. M. to expedite the handling of all types of materials from zinc to acids. To consult him on your problem, write Goodyear, Akron, Ohio, or Los Angeles,

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## BY CO-ORDINATING HAULAGE AND HOISTING CYCLES!

ODERN mechanization methods keep coal moving smoothly and speedily throughout the Southern Illinois mining district. And one big reason why high production is maintained is because there are no "bottle necks" at shaft bottoms. Haulage and hoisting cycles are closely co-ordinated through the dependably efficient operation of Nolan Car Caging Equipment. Loaded cars are easily handled — with clock-like precision — hour after hour and year after year.

Nolan Automatic Cagers, like Nolan Rotary Car Dumpers, Gravity Car Dumpers and other service-proven Car Control and Car Dumping specialties, are built in full conformity with the Nolan creed — your guaranty of service and safety:—

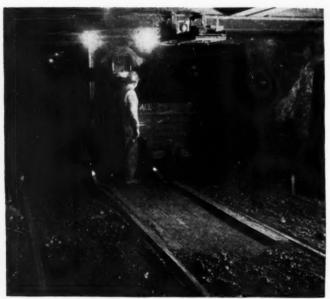
The name Nolan must always mean what it has always meant to mining men everywhere—complete dependability in mine car dumping and control devices.

We welcome difficult car control and car dumping problems. Full information is yours on request.





Handling 4 loaded cars a minute, this NOLAN Car Caging system is located at the shaft bottom of Bell & Zoller's Zeigler No. 2 mine.



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For each operation, by experienced engineers. The above illustrations show a few of these Enterprise designs. Each solves some particular problems, meets some specific requirement. This is the most certain way to get the most tonnage for the money you invest in cars. Investigate Enterprise before you invest, for maximum car capacity, lower car operating and maintenance cost.

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October, 1940 - COAL AGE

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# VENTUBE\* is pre-tested here...







Non Wonder "Ventube" flexible ventilating duct is so amazingly durable! It is made of only the finest extra-heavy, long fibered cloth woven to specific standards set up by the Du Pont testing laboratories. The fabric and even the thread that goes into the making of "Ventube" are then processed with a special chemical treatment to resist fungus growth. Next, this fabric is impregnated and then coated with a resilient composition on both sides to resist acid water, gases and moisture!

Rigid chemical control and high Du Pont standards assure you of getting the best ventilating results possible with "Ventube." It is balanced in strength in both the warp and the filler direction so it can withstand tearing and rupture. It is light-weight, flexible, and easy to handle. "Ventube" slides back quickly when blasting. Immediately afterwards it slides forward again, bringing clean, fresh air into your tunnel with only the aid of a motor-driven fan of proper capacity.

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THE FLEXIBLE VENTILATING DUCT



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A COMBINATION THAT ASSURES YOU MAXIMUM **ECONOMY AND EFFICIENCY** 

When you buy West Virginia track work, you get the best, but even the best materials need correct installation to give good service.

West Virginia engineers with years of wide experience are well qualified to assist you in correct planning and installation of your track work. They are glad to pre-sent "track work tips" that may be helpful, but even more helpful in your quest for efficient standardized track work would be an obligation-free consultation with them.



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**EVERYTHING IN TRACK WORK** 

RAILS AND ACCESSORIES FROGS AND SWITCHES SWITCH STANDS SWITCH TIES **CROSSOVERS** STEEL TIES

#### TRACK WORK TIPS

Cast iron frogs, due to low resistance to breakage, are not desirable in modern track. Semi-steel frogs, because of changes in strength due to variable steel content, are open to the same objections. Cast steel content, are open to the same objections. Cast steel frogs of low carbon content resist breakage, but are subject to a rapid pounding down of the wearing surfaces. Steel frogs of a higher carbon content. properly heat treated, give good results under medium weight traffic. Cast manganese steel frogs are adaptable to any type of service. They are more expensive than any other frogs, but they give long that the mean resisting quality of manganese. expensive than any other trogs, but they give long life, due to the wear resisting quality of manganese steel. All cast frogs should be secured in A.M.C. lengths, or no interchangeability is possible.

lengths, or no interchangeability is possible.

The flangeways of any cast frogs may be deep enough to clear all wheel flanges or they may just equal in depth the depth of the flange. This latter equal in depth the depth of the flange. This latter design is a flange bearing frog wherein the wheel rides on the flange while the tread is rolling over the throat of the frog. This greatly lessens pounding on the frog point. However, these shallow flange-ways offer an obstruction to the passage of deep flanged wheels on loading and cutting machinery.

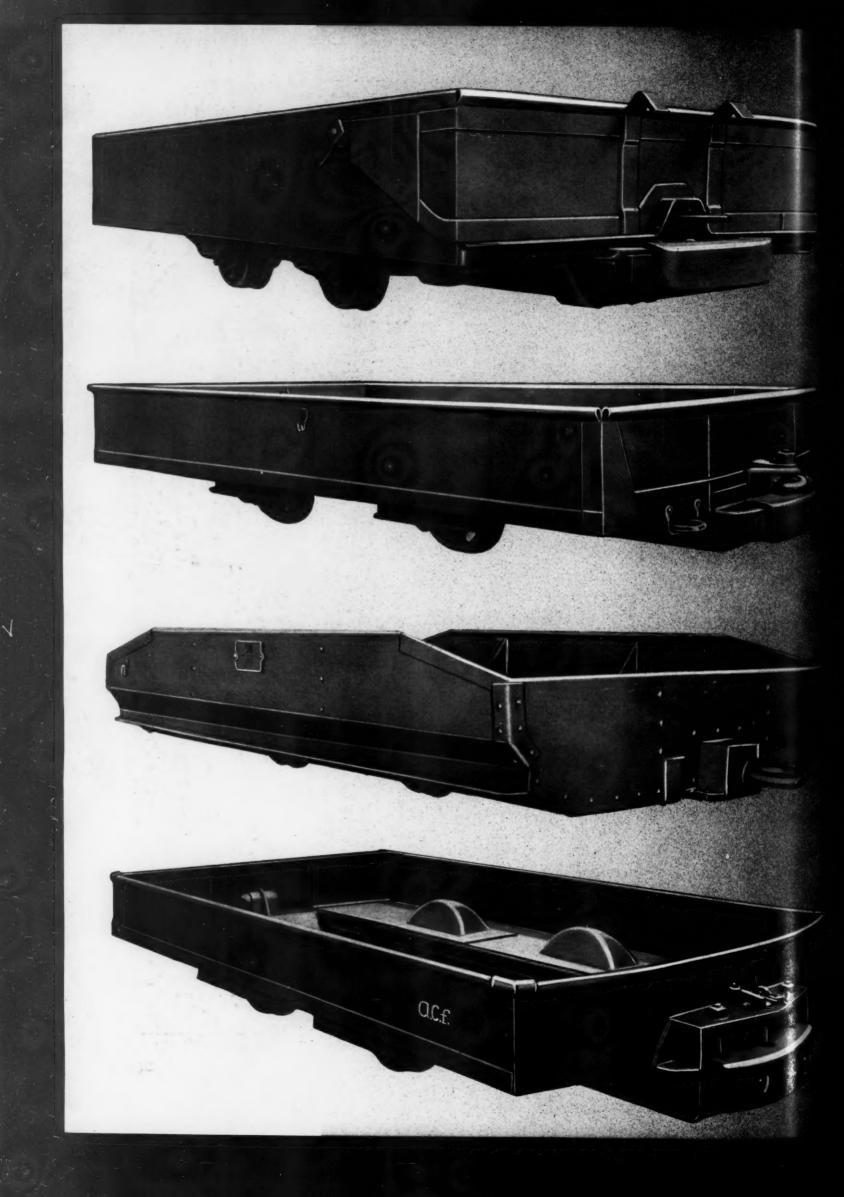
Self guarded frogs are provided with an elevated shoulder at the toe end, parallel to the gauge line and at a distance from it, equal to the width of the wheel tread. This shoulder prevents the whoel from wheel tread. This shoulder prevents the wheel from crowding sideways into the throat opening, eliminating the use of guard rails. For these frogs to be a success, all wheels must have the same width of tread. Any wide tread wheels will ride over the top of the shoulder.

Manganese insert frogs are so made, that the central wearing portions are of cast manganese steel, while the outer body and ends are of rail. The rails are machined and bent to receive the insert and the entire assembly bolted securely together. On short wide angle frogs, such as are used in mine work, the amount of manufacturing labor is out of proportion to the manganese saved, so that solid

proportion to the manganese saved, so that solid manganese frogs are more economical.

Spring frogs are made to provide a smooth path on the main traffic line. A spring wing opens only when traffic is moving on the siding line. It remains closed at other times giving an unbroken line of closed at other times, giving an unbroken line of rail on the main line. However, in mine frogs the angle is usually wide and the throat gap jump short. so that spring frogs are seldom used.

E WEST VIRGINIA RAIL



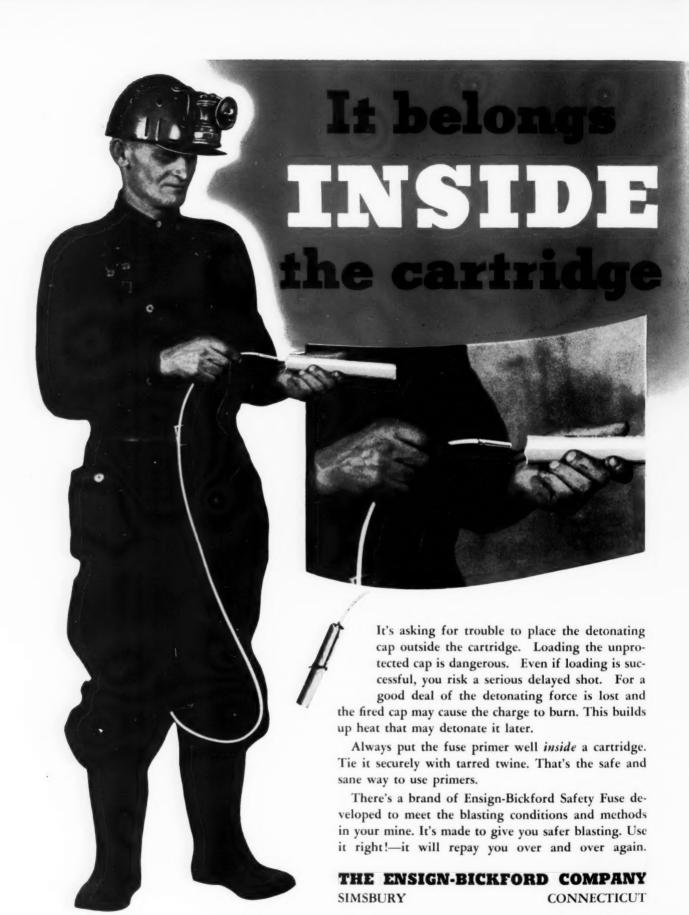
Prepare now for winter production. Winter conditions around the mines make tough going for mine cars. Especially if cars are old and need new parts. It may be that your cars should have new wheels - or possibly it would pay you to scrap your old cars entirely, instead of spending money for repairs, and buy our modern new cars. In any case, the time to act is now-whether you want new parts for old cars or a fleet of new mine cars—and the way to make certain you will get exactly what you need is to come to Q.C.f.

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# Coal Age

Established 1911 - McGraw-Hill Publishing Co., Inc.
SYDNEY A. HALE, Editor • OCTOBER, 1940

## **Unwearied Pioneers**

INDUSTRIAL trail-blazing knows no narrow geographical bounds. So many individuals in so many different coal-producing States have pioneered in better mining practices that it is sometimes difficult to say just who initiated a particular advance on the modernization highway. Experiments with mechanical loaders underground, for example, began more than fifty years ago, but it was 1922 before any mine was ready to load all its coal with such equipment. That mine was in Indiana.

Southern Illinois, however, has the distinction of being the first major district to adopt such loading as standard practice. This movement began in the middle twenties and has been expanding ever since. The compelling motive was twofold: competition from lower-wage Southern fields and the emergence of strip mining from the marginalproducer class were making the position of the Illinois deep mines increasingly precarious. A reduction in deep-mine costs was imperative to survival; the increased productivity per man inherent in mechanical loading promised that reduction.

ACHIEVEMENT of results outstanding in the annals of the industry has not been accidental. Neither can they be attributed primarily to

favorable natural conditions. Management's whole-hearted acceptance of responsibilities too often ignored or evaded in hand-loading operations is the key. Success depended upon coordination of men and machines. There was no reservoir of skilled operatives to draw upon; management had to train the men it already had. And it did it with relatively few replacements in either supervisory forces or mine workers.

UNLIKE the weary pioneers who see late-comers flashing by them, southern Illinois operators have continued in the vanguard. Production per machine-shift and-what is more important-per man have steadily risen. Tonnage handled mechanically also has been going up. Back in 1927, only 3.6 per cent of the Illinois output was so handled and 6.1 per cent was stripmined. Last year the percentages were 62.0 and 26.3, respectively. Deep mines in the Franklin-Williamson-Saline sector, however, loaded 91.8 per cent of their output mechanically.

WHILE hanging up tonnage records, southern Illinois has given a convincing demonstration that mechanical loading can be made an effective handmaiden of safety. As shown elsewhere in this issue, fatality rates per million tons have dropped below the average for the

State as a whole. Man-hours' exposure per fatality at mechanized operations have been increasing. Southern Illinois mechanical mines have made an outstanding record in the matter of major disasters. Since 1925 there have been only three such disasters entailing a total loss of 21 lives.

PIONEERING has not been confined to loading equipment. In the drive for coordination, management has been subjecting every phase of the operating cycle to critical analysis. Southern Illinois mines fathered the earliest experiments in air and carbon-dioxide coal breaking; hydraulic breaking also was worked out on a commercial basis in this field. Rubber-tired haulage too was a southern Illinois innovation, and the spread of that system to other fields is history.

This summary hits only a few of the high spots in the achievements of this field. Pages might well be written about other pioneering developments, including merchandising and the phenomenal growth of the sale of domestic-stoker coal. Because of them, mechanized operations—deep-mine and stripping—have been chosen as the theme of this 20th Annual Model Mining Number of Coal Age. The inspiring story of this area is told in greater detail in the pages which follow.

## MANAGEMENT'S ROLE

## In Southern Illinois Mines

SCIENTIFIC management recognizes no mental hazards. Substituting fact for opinion and actual practice for theory, it has evolved a science as exact as measurement by simple arithmetic can give. That such management is vital to coal's economic future is obvious. To survive, the industry must press constantly for lower costs. If proper wage standards are to be preserved, such costs can be attained only by complete coordination of modern equipment, man power and natural physical conditions.

Southern Illinois is an outstanding example of the progress and advantages of scientific management. Present operating efficiencies were not gained overnight. Neither are they due to particularly favorable natural conditions. They are the outcome of painstaking analytical studies of equipment, man power, mining systems and individual physical mine characteristics.

#### Machines Used in Eighties

Bituminous stripping was cradled in the Danville district in 18861 and mechanical loading underground was tried out in southern Illinois in the nineties. Largescale experiments with deep-mine loading, however, did not start until 1924-the year a loading-machine scale was first written into an Illinois contract.3 In 1927, when interest in the movement had begun to acquire momentum, only 3.6 per cent of the State tonnage was loaded by underground machines and only 6.1 per cent was recovered by surface stripping. Last year, deep-mine mechanical loading accounted for 62.0 per cent of the output of shipping mines and stripping for 26.3 per

These figures record an increase in total output mechanically loaded by deep mines and strippers from 9.7 per cent to 88.3 per cent in thirteen years. But the southern Illinois counties featured in the present Model Mining Number of Coal Age loaded 93.2 per cent of their total output by mobile machines, pit-car loaders, conveyors and strip shovels. And during that 13-year period the State has witnessed a revolution in methods and management approach.

Change from hand to mechanical loading completely shifted responsibility for face production from tonnage men and Scientific management of a coal company embraces all the ramifications of sound public and internal relationships. Analysis of physical mining conditions in relation to types and functioning of modern equipment is of primary importance. But so, too, are the careful selection of able executives and operating organizations and the improvement of personnel efficiencies. Management also is held accountable for the physical and mental well-being of every employee. Basically, therefore, scientific management is economic education in improved and safer production with modern equipment for lower costs. Southern Illinois is a case in point.

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miners to management. Measurements of both tonnages and costs under the new method immediately became necessary. These measurements first took the form of daily reports by the loader operative, showing causes of delays in minutes per shift, with machine running time approximated by subtracting these delays from total operating hours.

Since many of the earlier machines proved faulty in design and construction, with resultant mechanical delays, and mine personnel lacked experience in mechanical-loader application, closer managerial supervision and more intensive maintenance were imperative if the economic advantages of the new system were to be fully realized. Such advantages could be achieved only through the study of adequate daily and monthly cost and tonnage records for each unit and application of corrective measures to overcome the inefficiencies thus revealed. Time studies, to over our over used to uncover differ-

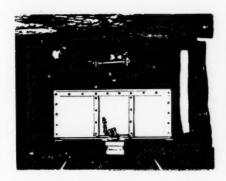
ences in the skill or initiative of machine crews and the effects of varying physical conditions and mining layouts on productivity and costs.

At least 35 variables—ranging from the attitude of the men through physical conditions, mining methods, equipment and wage rates—may affect mechanical-loading results. Management's job, therefore, is one of man-power education for machine-power balances. These balances were first studied individually and then collectively for their plus or minus effects. Proof of accomplished efficiencies were found only in the summaries of each operating phase and in the over-all cost per ton at each mine.

#### Cost-Keeping Revised

Cost control at mechanized mines also called for many changes in accounting procedure. Accounting classifications had to be revised and daily cost statements recast to cover costs on individual loading machines. In an all-mechanical mine carrying day-rate workers, any delay in the operation of a machine magnifies the increased cost which the operator must pay. So management evolved the necessary records to control the interlocking of all phases from the face to loaded railroad cars. At some properties, the superintendent receives a report every two hours showing the number of cars loaded by each machine crew and the number and causes of any substantial delays affecting the proper daily production from the section.

Intensive face supervision gave manage ment the opportunity to better apply safety procedures because of the concentration of employment. Since with mechanical loading fewer men are required for a given output, man-hours of exposure are reduced. Furthermore, the machine-more than the men-is exposed to the hazards of loose coal falls from ribs and roof. Concentration also results in speedier extraction and lessens exposure in a given area. Where, under handloading it required 500 days to work out a pair of panels in some mines, only 60 days is required under the mechanical-loading set-up. More efficient ventilation, drainage, transportation and power distribution too are possible with concentration. Definite starting and quitting time for load-



ing crews hauled to and from working territories in man trips also has promoted

But management has had to guard against the hazards inherent in the introduction of any new system or machine. Measures must be taken to prevent accidents which might arise from the increased speed of the operating cycle, a sense of false security created by the absence of men at the immediate working face, too hurried or casual roof inspections and the noise of the machines during sounding inspections. Hazards due to congestion are greater and, unless rapid car changes are properly systematized, serious accidents may occur.

#### Mining Becomes Safer

That scientific management in southern Illinois has met the changing conditions with better safety practices and lower accident rates is a matter of record. Over-all figures are given on page 77. The experience of one company is here added to round out the picture. Tons per compensable accident for that company rose from 4,516 under hand loading in 1927 and 1928 to 20,170 tons under mechanical loading last year. Cost per compensable accident dropped from \$292.62 in 1928 to an average of \$252.00 for the 13-year period 1927-1939. Cost per non-compensable injury, however, rose from \$7.41 in 1928 to an average of \$7.56 for the same 13-year period. Total accident costs the past five years have averaged 5c. per ton less than in 1927-28.

Personnel building for mechanized mining is one of the biggest problems management has had to solve.5 Lacking men already experienced in mechanical loading, southern Illinois management faced the necessity of training its own forces. Selection was made from those who had sufficient experience at the face and enough education to read and grasp what was being done at other mines and districts and apply the ideas in their own bailiwicks. Qualities of leadership, ability to handle and instruct men under them and to plan the work so that maximum results might be achieved by their own units each day also entered into the selection of these crew leaders.

Under such face foremen so trained, direct supervision soon developed cutters, drillers, loader operatives and helpers, haulage, trackmen and timbermen who could also be trained in the new ways of

work performance for the best utilization of the machines. At the same time, safety procedures and practices readily were inculcated.

Mechanical loading completely changed the duties of mine foremen and assistants. Under the new régime, haulage bosses must dispatch empties to the sections producing the most coal at that particular time instead of relying on a reasonable rotation of empty trips. They must be familiar with conditions in each section so that car-change time is held to the minimum and haulage equipment is kept in the pink of condition. For, with mechanical loading, a gathering-motor breakdown stops production from a loader unit and a swing-or main-line locomotive failure may cause the loss of tonnage from a section containing many loading machines and their crews.

In modern mechanical mining, the mine foreman must not only look after general mine safety and handle minor labor disputes but also must assume direct responsibility for making the whole scheme of coordination work. Definite knowledge of each section's condition, how operations may be changed in case of emergencies and how machine loading rates may be improved must be continually in mind. Daily production and costs are his direct responsibility. Maintenance crews must be organized and equipped to function smoothly and efficiently in keeping all equipment up to standard and to act quickly should emergencies occasion undue loss of operating time.

Scientific management has abolished the secrecy formerly surrounding costs. As chief coordinating officer of all the mine departments, the superintendent has learned that comparative records constitute a firm foundation on which constructive discussions and criticisms of operating practices can be built. Some mine bulletin boards carry loading crews' daily tonnage records for all to see and compare. At others, meetings of face bosses, assistant foremen, foremen and the superintendent are regularly scheduled for detailed analysis of all working cycles.

Modernization programs have converted the former "boss of the property" into the highly efficient, analytical, executive type superintendent of today. This conversion has had far-reaching effect on all mine personnel from superintendent down. While some replacement of men who could not or would not grasp the new requirements was necessary, by and large Illinois has proved the willingness of most miners to accept changing conditions and new systems.

Education of foremen, face bosses and loading-machine operatives progressed slowly at first. With the gain in practical applications, however, experienced men were finally developed and it became easier to fill vacancies as time went on. High school graduates have been found to be better equipped to grasp the principles of mechanization and from this group of younger men are chosen the machine operators and face bosses of the future.

#### Men Learn Rapidly

Mechanically minded men have quickly adapted themselves to all improved and newer type machines. Suggestions for their more successful usage are constantly being proposed by this rapidly growing group of employees. Free discussion and encouragement of criticism and suggestions from mine personnel have become one of the most important phases of management today.

Economic proof that scientific management has developed high efficiencies in Illinois mines is found in U. S. Bureau of Mines statistics. Stripping in Illinois in 1936 averaged 15.63 tons per man-day, against 12.60 tons for the country as a whole. Illinois deep mines averaged 5.81 tons per man-day as compared with the national average of 4.42 tons. Figures from individual Illinois mines show annual averages of 20 tons and more per man-day in stripping and 12 tons and upward for some of the newly equipped mechanized underground properties.

y Tanbles, Coal Age, October, 1954, p. 59.

Personnel, Coal Age, June, 1930, p. 351.

Output per Man, N.R.P. E-9, August, 1939, p. 366.



<sup>&</sup>lt;sup>1</sup> Stripping, Coal Age, October, 1936, p. 413. <sup>2</sup> Milestones, Coal Age, October, 1936,

p. 405.
Time Studies, Coal Age, April, 1938, p. 55.
Variables, Coal Age, October, 1937,

# MINING METHODS AND MECHANICAL LOADING

## Southern Illinois Deep Mines

ONG leaders in the use of mechanical equipment, southern Illinois shipping mines present a picture of almost complete mechanization of loading. This close approach to 100-per-cent machine work, plus continuous improvements in methods and equipment, is reflected in a high productivity per worker—13.1 tons per man-shift underground for the 23 deep mines in Franklin, eastern Jackson, Jefferson, eastern Perry, Saline and Williamson counties covered in the Coal Age survey.

Southern Illinois mechanical mining goes back to 1891, when a Stanley header was tried by the Egyptian Coal & Mining Co., Duquoin. In 1903, a Hamilton loading machine was installed at Dewmaine by the St. Louis & Big Muddy Coal Co. Ten Hamilton machines later were ordered for Zeigler mine, one of the Bell & Zoller Coal & Mining Co. group, but only one was installed.

Serious mechanical mining did not start, however, until after 1920, when Illinois operators turned to it to compete with other fields paying lower wages. The Chicago, Wilmington & Franklin Coal Co. acquired both Joy loading and Myers-Whaley shovel equipment in 1920. Two years later, a rock "Shuveloader" was installed by the Old Ben Coal Corporation and a Conway rock loader by the Union Colliery Co. In 1923, C. W. & F. purchased nine Joy 4BU loaders, continuing with the 5BU machines brought out in 1924. C. W. & F. also was a party to the first mechanical-mining contract in Illinois, drawn up in 1924. The same year the Union Colliery Co. installed the first Goodman power shovel at Kathleen mine.

Kathleen went completely mechanical in 1926, and in March, 1927, was loading an average of 4,379 tons per day. Using both power shovels and 5BU loaders and working 21 machine-shifts, the mine now averages 5,300 tons per day.

New Orient (C. W. & F.) was completely mechanized in 1929 and the first Clarkson loader was installed in Orient No. 1. By 1929, the pit-car loader, or "conveyor," was making its appearance in large numbers. The first Jeffrey 44 loader in southern Illinois went into the Rex Coal Co. mine, Eldorado, in 1931. Old Ben Coal Corporation put the first Goodman 260-A track-mounted

loader in southern Illinois in service in 1935 and installed the first 360-A machine in 1938. The first Jeffrey L-400 machine was installed by the Freeman Coal Mining Co., Herrin, in 1936.

Some fifteen deep mines in southern Illinois with a total output of 6,744,321 tons were handling two-thirds or more of their total tonnage with either loading machines or pit-car loaders by 1933, and the average output per 8-hour man-shift underground at these operations had risen to 10.1 tons. Eight of these mines, producing some 2,545,000 tons, handled two-thirds or more of their tonnage with pit-car and hand loaders.

#### Improvements Raise Efficiency

Displacement of pit-car loaders with loading machines, further restriction of hand mining and improvements in methods and machinery, including installation of higher-capacity loaders, steadily increased efficiency in succeeding years. Consequently, the output per man-shift underground stood at 10.9 tons in 1939, the latest year for which figures are available. In that year 28 mines in southern Illinois handling two-thirds or more of their output mechanically shipped 14,084,814 tons, or nearly 40 per cent of the total Illinois deep-mine production of 35,341,752 tons.

The ground work for still higher efficiency was laid in 1936 when the Blue Bird Coal Co. pioneered the rubber-tiredhaulage idea developed by James H. Fletcher, In 1938, Buckhorn mine, Consolidated Coal Co., and Bankston Creek No. 5 mine, Bankston Creek Collieries Co., an affiliate of the Sahara Coal Co., both using room and mother conveyors behind loading machines, swung into production. Two additional conveyor operations went in in that year and 1939. Last year, the Consolidated Coal Co. started shuttle cars at Jefferson No. 20 mine, followed by the Peabody Coal Co. with installations at Harrisburg No. 43 and Harco No. 47. Shuttle cars also were installed at Buckhorn early in 1940.

As a result of these steps, plus advances at other operations, the 23 mines included in the 1940 *Coal Age* survey showed an average efficiency of 13.1 tons per 7-hour man-shift underground. This



Starting off a working place in No. 6 coal with a high-capacity caterpillar loader in Royalton No. 7 mine.

figure is based on replies to questions as to (1) average number of employees charged to underground operation per day and (2) average daily tonnage shipped. Individual mine records ranged from 9.4 to 33.3 tons per man-shift underground, the latter for a new all-conveyor-loader operation.

Mechanical mining naturally helped southern Illinois hold its share of the available business in the low-wage days in other competitive fields and put the district in a better position to fight off substitutes. Thus, southern Illinois has been able to continue to pay high wages, provide relatively good opportunities for employment and absorb large expenditures for product improvement.

Mechanical mining also has resulted in substantial safety gains. The fifteen mines in the district handling two-thirds or more of their tonnage mechanically in 1933 had a fatality rate of 3.26 per million tons, which was considerably higher than the deep-mine rate of 2.12 for the State as a whole. Man-days of exposure per fatality at these fifteen mines averaged 38,000. By 1939, however, bearing out the contention that mechanical mining normally promotes safety, even though injuries may rise temporarily during its introduction, the 28 mines in southern Illinois producing two-thirds or more of their tonnage mechanically had a fatality rate of 1.92 per million tons, compared with the State deep-mine rate of 2.23. Man-days of exposure per fatal accident averaged 62,500 at these 28 mines.

#### Safety Follows Machines

Concentration of operations, better supervision, more systematization of timbering and other safety measures and promotion of a feeling of mutual responsibility among workers making up loadingunit groups are factors in these results. Better opportunities for safety education and almost universal use of such protective items as hard hats, safety shoes and electric cap lamps also played a part. Concentration has resulted in a substantial increase in ventilating efficiency.

Rock-dusting with machines is almost universal in southern Illinois mechanical mines, and Old Ben No. 11 still uses the forerunner of present pressure-type rock-dust distributors. This machine was built in 1924 under direction of John E. Jones. In many cases, machine dusting is supplemented by barriers, including the new Jones protective system at all Old Ben mines based on suspended bags of rock dust fitted with vanes, triggers and rip wires to tear open the bags and release the dust under influence of the pressure wave preceding an explosion (Coal Age, October, 1938, p. 40).

Shafts predominate in southern Illinois. Jefferson No. 20, Consolidated Coal Co., with a 740-ft. opening, is the deepest going property in the State. New operations, however, have installed slope openings with belts to bring out the coal (see p. 96). These include Buckhorn, Bankston Creek Nos. 4 and 5, and Blue Bird



Low-type track-mounted machine bailing up No. 6 coal in Old Ben 15 mine.

No. 6. Average cover at these operations ranges from 75 to 185 ft. Minimum cover at shaft operations is 100 ft., while the average at most ranges from 300 to 500 ft. General dip of the coal measures is 1 to 2 per cent northeast.

All mines studied in Franklin, Jefferson, eastern Jackson, eastern Perry and Williamson counties recover the Illinois No. 6 seam ranging from 5 to 12 ft. thick. Total thickness, however, normally varies from 8 to 10 ft. Thickness mined generally is 7 to 9 ft., the remainder (usually 1 to 2 ft.) being left to help hold the normal gray shale roof, which varies from downright bad to relatively good, but seldom is strong enough to warrant mining without leaving top coal and setting timbers. Faults, some with throws of 25 ft. and up, are fairly numerous, while slips and horsebacks are frequent in certain territories, adding to the problem of orderly extraction.

Faults, slips and horsebacks also are encountered in the Illinois No. 5 seam, worked by all the Saline County mechanical mines studied. No. 5 thickness ranges from 4½ to 6½ ft., with the average somewhere around 5. The entire seam is recovered, necessitating, in most cases, handling up to 18 in. of drawrock. With the drawrock down, the roof usually is a good, strong shale, although in some cases the drawrock may be only one of several types of material in a very variable top. Both the No. 6 and No. 5 are underlaid by fireclay.

Mining in southern Illinois, with a few exceptions built around new transportation methods, is based on the panel system, under which the working territory is divided into individual sections, or panels, each normally protected by solid pillars on all sides except where the headings are driven in from the cross or main entries. While a number of mines still use two-heading main entries and some run three, mains and crosses at most properties are made up of four to

six headings. And several mines on the two-heading system are raising the number to three or four to provide more places for development machines, increase airway area and facilitate installation of sidetracks, etc.

Heading centers on main and cross entries usually range from 32 to 50 ft., with some as low as 29 ft. and others up to 60 ft., as at Jefferson No. 20, where the cover is exceptionally thick. Heading width in No. 6 coal mines ranges from 12 to 14 ft., compared with 12 to 20 ft. in the No. 5 seam, where the immediate roof normally is stronger. And in one No. 6 mine, while haulage headings are held to 14 ft., airways are increased to 18 ft. or more for greater area.

#### Three-Heading Panels Used

Panel entries at mines using track and mine cars behind loading machines normally are made up of two headings, although at least one has raised the number to three primarily to help development machines. In these conventional set-ups (excluding rubber-tired-haulage and conveyor systems), headings normally are driven 12 to 14 ft. wide on 29- to 42-ft. centers.

Rooms, as usual in panel mining, are turned both ways from the entry. In track-and-car mines, both sides of a panel are worked simultaneously. Ordinarily, rooms are driven at right angles to the entry. New Monarch, Consolidated Coal Co., however, is an exception. Here (Fig. 1) a 60-deg. angle was adopted to ease haulage curves. Stub rooms are driven off No. 1 room on one side to recover the triangle. But even where rooms are not turned at an angle, necks (see accompanying panel and track plans) normally are started at a slight angle, rooms are widened on the inby side or corners are knocked off to ease the curve.

Number of rooms on a panel entry

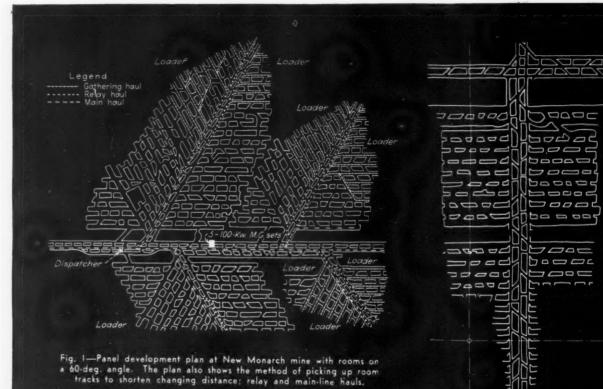


Fig. 2—Room panel at Royalton No. 7
mine. showing how auxiliary protective pillars are formed by omitting rooms on each side.

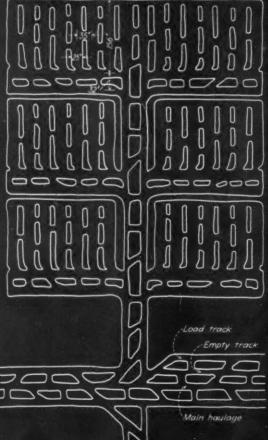


Fig. 3—New standard room panel for New Orient mine. Plan also shows method of installing sidetracks for empties and loads.

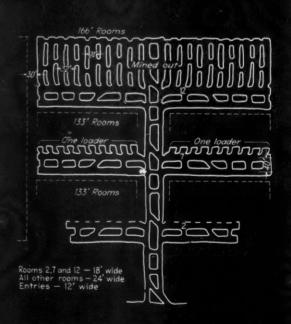


Fig. 4—New standard room panel for Orient No. I mine, showing method of driving short, wide rooms off stub entries.

varies widely. In some cases, as at Kathleen (Fig. 6), where Goodman power shovels do much of the room work, the number is as low as ten on a side, or a total of twenty. In other operations, panel entries may be continued indefinitely. Number of rooms to a production unit also figures in panel size, and in turn is influenced by loading-machine capacity. In general, however, 16 to 24 rooms are turned off each side, making the total per panel 32 to 48. In most cases, two loading machines work in a panel, one on each side. Less frequently, one loading machine is assigned to a panel. Where this is done, the machine normally works out the inby half first.

Room centers at the majority of the track-and-car mines are either 45 or 50 ft. One, however, contemplates driving some places on 30-ft. centers, while another—incidentally with the lightest cover—runs on 52-ft. centers. It can be seen, therefore, that centers do not vary with cover thickness. The same applies to room width, normally 24 to 28 ft., with infrequent increases to as high as 40 ft. where exceptionally good top prevails. Apparently, 24 to 28 ft. best suits the conditions imposed by the usual roof and the effective reach of loaders and track-mounted cutting equipment. Room depth normally varies from 250 to 350 ft. Several reasons underlie driving rooms less than 300 ft. deep. One is the possibility of loss of coal by roof deterioration and weight in deeper places. Another is elimination of some of the moving up of changing switches otherwise necessarv.

#### **Machines Raise Extraction**

With the room centers and widths normally employed, extraction within a panel seldom is less than 60 per cent when crosscuts are included. Mechanical mining, in fact, with its speedier advance, actually has increased extraction in several mines. At Black Arrow No. 18, Peabody Coal Co., for example, it was difficult, due to roof character and other factors, to work out completely many panels (250-ft. rooms) with hand loading. With mechanical loading, it seldom is necessary to leave a panel before completion.

Theoretically, the coal left in room pillars and panel-entry chain pillars is just sufficient to prevent squeezing and roof deterioration during time normally necessary to work the panel out. As an added precaution, however, several mines leave one or more larger blocks of coal at strategic points. At Valier mine, Valier Coal Co. (rooms 24 to 38 ft. wide on 50-ft. centers; 250 ft. deep), these protective blocks are formed by omitting Nos. 7 and 12 room necks on each side of a panel eighteen rooms deep, then picking these rooms up through crosscuts. Thus, four protective stumps are formed in a 36-room panel.

At several other mines, the protective blocks are formed by omitting a room, as at Royalton No. 7 mine, Franklin County Coal Corporation (Fig. 2). In a standard 48-room panel (24 rooms 300 ft. deep and 26 to 32 ft. wide on 50-ft. centers), No. 11 or 12 room on each side usually is omitted, leaving a solid pillar as a protection against squeezing and an aid to sealing in case of trouble in inby places. Upon completion of the panel, in many cases, stub rooms are driven through the protective blocks.

Substantially the same practice is followed at Black Arrow No. 18, Majestic No. 14 and other Peabody mines in the district, where the blocks commonly are termed "fire pillars." At Black Arrow No. 18, where panels consist of twenty rooms on a side 250 ft. deep and 24 ft. wide on 50-ft. centers, No. 11 room normally is omitted on each side. When the panel is completed, fire pillars are recovered by driving about five places 18 to 20 ft. wide on 40-ft. centers through them from No. 10 or No. 12 room.

#### New Method Cuts Losses

Increasing extraction over the basic figure normally is accomplished, where roof and weight permit, by increasing room width or slabbing pillars, usually the latter. Slabbing, in some cases, has raised extraction within a panel to 75 or 80 per cent, but, like widening rooms, is somewhat unreliable at best. The Chicago, Wilmington & Franklin Coal Co. therefore has developed a working method to increase extraction while eliminating difficulties from squeezing and roof deterioration.

The new system at the Orient mines (Figs. 3 and 4) is based on recovering a small block of coal rapidly by wide, short rooms on short centers. Thus, although pillar size is reduced, the area is worked too fast for serious squeezing and roof trouble. Concurrently, pillars are small enough to permit the shale to break to the cap rock (10 ft. of limestone 40 to 60 ft. up) soon after the rooms are completed and thus relieve the weight on the next places.

In developing the new panels the regular two-heading panel entry is driven. No rooms are turned. Instead, stub entries are turned right and left at the inby end. From these, seven or ten rooms, depending upon the mine, are driven up, each group on a side being a loading-machine territory. Room centers are 32 or 35 ft., width is 24 to 26 ft., and depth ranges from 133 to 163 ft. When the two inby groups are completed, the loading machines drop back to the next stub entries, which have been gotten ready in the interim, and again start to work. Meantime, the workedout sections are left, preferably to cave to the cap rock. As the new sections are protected by substantial thicknesses of virgin coal, squeezing and caving in the old cannot affect them.

#### 250 Machines Used

The 23 deep mines surveyed by Coal Age were operating some 250 loading machines, exclusive of spares. Reflecting early mechanization in the region, about 100 machines are Joy 5BU units. Special machines include two McKinlay entry drivers at New Orient. The six Goodman power shovels in the region all are at Kathleen. Track-mounted loading machines in service totaled about 50, with 26 Goodman 260-A and three 360-A track-mounted loaders at Old Ben Nos. 8, 11, 14 and 15 mines, along with 21 pit-car loaders. Royalton No. 7 was using three Goodman 260-A machines with one Joy 5BU, three 11BU's and six pitcar loaders. Clarkson loading machines with 5BU's were in service at Orient No. 1, while Freeman Spur, Seymour Coal Mining Co., was operating three Jeffrey 44-DD and three Jeffrey L-400 machines. Another mine still using pitcar loaders was Majestic No. 14, working some 20 in conjunction with eight

The seven of the 23 deep mines using rubber-tired haulage or conveyors were operating 43 of the 250 machines, viz:



Loading No. 6 coal with a track-mounted machine in Orient No. 1 mine.

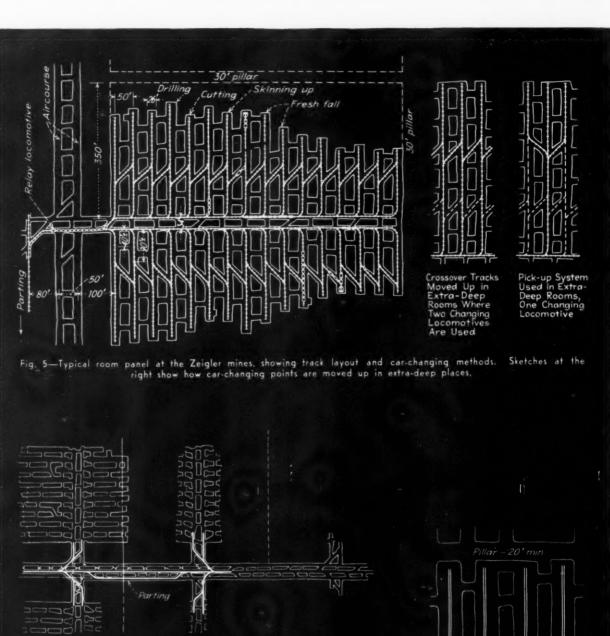


Fig. 6—Showing typical 20-room panels at Kathleen mine in both the development and production stages; also, how sidetracks are installed and panel entrances are reversed for easy parting access.

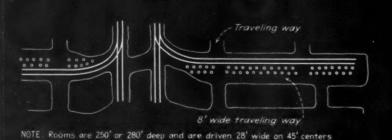


Fig. 7—Track and timbering plan in a power-shovel room at Kathleen.



Fig. 8—Method of connecting room tracks through the crosscuts at Old Ben mines to shorten distance and facilitate two-locomotive changing.

Normal room depth

two 5BU'S, 22 7BU's, 17 8BU's and two 14BU's. Average output per machineshift, development and production, was 250 tons. Five operations are in the thinner No. 5 seam. Also, several still are developing and two still produce partly with track and cars. Notwithstanding, average output per man-shift underground at these seven properties was 15.5 tons.

Average output per man-shift underground at the sixteen mines serving their 203 loading machines with track and cars was 12.7 tons. This lower figure may be explained in part by the inherent limitations on mine-car changing. Also, these mines, all several years old, require relatively more men for main haulage, track, wire, stoppings, timber, etc. Mines in this group using track-mounted machines for 50 per cent or more of their output averaged 350 tons per loadingmachine shift, both development and room work. Mines using caterpillarmounted loading equipment averaged about 310 tons per machine shift. The difference is due in part to the fact that the track-mounted equipment, mostly installed in the last five years, generally has a higher capacity than the older caterpillar-mounted equipment still used in large numbers. From the standpoint of production per man-shift underground, however, excluding pit-car loader and hand tonnage, there appears to be little difference between mines using the two types of machines.

#### **Development Machines Used**

Separate development machines are regularly used by the majority of the sixteen operations employing track and cars. At some of the conveyor and rubber-tired-haulage operations, the line between development and production is less clear. Entry-driving is confined to the summer months at some conveyor operations. At others, room-entry and room work normally go hand in hand and even main-entry development is incorporated in production where possible.

Development crews may be as big as or bigger than room crews at track-and-car mines, although some small-crew units are operated. Consequently, development-machine output may run from 50 to 60 tons a shift on up, as compared with 350 to 450 tons for the usual production machine. At Majestic 14, however, the practice is to drive the panel entries and take the first cuts out of room necks with pit-car loaders. Two men comprise a loader crew, with a cutting and drilling crew for each ten machines. When the pit-car loaders have completed their work, hand loaders drive the places until widened. Finally, a "bull gang" gets the panel in shape for two 11BU loaders, one on each side.

Black Arrow No. 18 also uses the "bull-gang" system common to Peabody operations. All machines are 5BU's and development and room crews average fifteen men. Development machines drive the panel entry, neck the rooms and



High-capacity track-mounted loading machine at work in No. 6 coal, Freeman Spur mine.



In this illustration, made at Freeman Spur mine, the front of two cars has been pulled out from under the rear conveyor to permit loading the second car.

drive them about 40 ft. The bull gang, a foreman and ten men, then fixes up track and switches, takes care of wire and timbering and otherwise prepares the panel for two production machines.

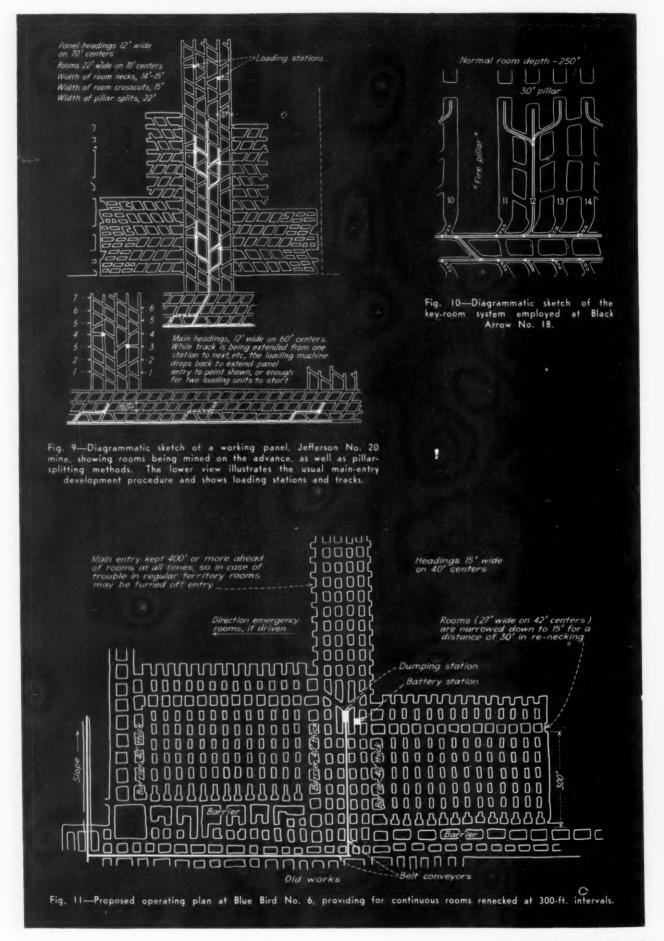
Using Jeffrey 44-DD machines largely for development and L-400 machines for production, Freeman Spur mine employs a modification of the "bull-gang" system. A 44-DD loader drives up the panel entry and necks the rooms and is followed by a crew which re-lays the track and puts the territory in shape for an L-400 unit, which normally makes an entire 20-room panel.

Substantially similar development plans are followed at several other mines—without, however, regular bull gangs. At New Orient, development machines drive the panel entries up, turn the stub entries (Fig. 3) and neck the rooms. Then, the

development machine starts the next stub entries for the machines. A similar plan is followed at Orient No. 1.

Power shovels work rooms at Kathleen and all development is done by 5BU's, which also help out in room production. A 5BU drives up a panel entry (ten rooms on a side), necks the rooms, drives them in to the first crosscuts, made in line (Fig. 6) to form a traveling way off the heading, and then takes two additional cuts out of the room faces. Two power shovels then follow each other up one side of the panel, across the top and down the other. When Joys are used in room work, one machine takes one side of a panel and a second the opposite.

Valier development normally is based on a room machine taking over after a certain point. Using 11BU, 7BU and 5BU machines, Valier commonly oper-



ates about four on a cross entry—two in wide, one in wide-and-narrow and one in narrow work. In opening a room panel, a narrow-work machine drives the entry up to 8 or 9 room and advances the rooms in to the first crosscuts. Then, a combination machine comes in and mines the rooms and extends the panel entry to the full 18-room depth. Then, one wide-work machine takes one side and another the other.

With 5BU, 7BU and 11BU equipment Zeigler No. 1 mine usually develops with the 5BU units. In starting a panel, the first two rooms are driven in about 150 ft. to provide car storage. The development machine then opens up eight or ten places on either side, whereupon a production machine takes over in the rooms and extends the entry to full 16room depth. This machine also concentrates on driving seven and eight or eight and nine rooms on each side to about 150 ft. for car storage. When the room crossover tracks can be laid (Fig. 5), thus providing ample changing room, a second production machine comes in to take one side of the panel, leaving the other to the original unit. At Zeigler No. 2, a 5BU usually drives the panel entry up and necks the room, after which an 11BU moves in. Then, when the first crossovers are in, a second 11BU is introduced.

#### Skeleton Crews Employed

Development at Royalton No. 7 and Energy No. 5 mines, Franklin County Coal Corporation, and at Old Ben operations is handled by regular production machines assisted by skeleton crews. At Royalton and Energy, these crews number five as a maximum, while at Old Ben two-man crews load out places, clean up and otherwise expedite starting or finishing territories. As an example of combination development, an entry machine at Old Ben may drive both a main and one or more panel entries in addition to working out a panel. Normally, a loading machine (260-A or 360-A) first works ten rooms on each side on the inby end of a panel. Then it moves out and works

eight more rooms on each side, at the same time doing entry work in the vicinity. Finally, a skeleton crew may take out a few cuts left in the old room territory while helping the regular production machine by loading cuts in the headings.

Mechanical-mining-unit make-up in southern Illinois track-and-car operations varies widely. Major departures from what might be called the standard of one loading machine, one cutting machine, one drill and one locomotive occur in cutting. In many cases, old-type shortwalls are unable to keep up with high-capacity loaders, making extra machines or cutting necessary. Conversely, several operations employ track-mounted equipment and make use of the extra capacity to cut for more than one loading machine.

#### Two Drills Usually Required

Many operations also find it necessary to use two drills per loading unit. And approximately half the track-and-car mines use two locomotives in car-changing. The rule of one relay locomotive to two loading machines, however, holds fairly well, although Freeman Spur, for one, runs main-line locomotives directly into room panels.

A few operations base a mechanicalloading unit on two loading machines. At Energy No. 5, a unit comprises two 7BU's, two Goodman universal shortwalls, two Dooley post-mounted drills and six mules. The Kathleen powershovel unit includes two Goodman power shovels, two Goodman shortwalls, Joy caterpillar-mounted or Goodman or Sullivan track-type shearing machine, two Chicago Pneumatic post-mounted drills and two Goodman 6-ton cable-reel locomotives. Users of battery-powered gathering locomotives include Zeigler No. New Monarch, Royalton No. 7 Majestic No. 14, Freeman Spur and

This loading machine in Buckhorn mine is placing No. 6 coal in a chain conveyor laid in the center of the room. Valier. Royalton No. 7 and Valier, as examples, commonly work battery and cable-reel units together in two-locomotive changing to reduce the cable interference that otherwise might be encountered unless all tracks were connected through crosscuts.

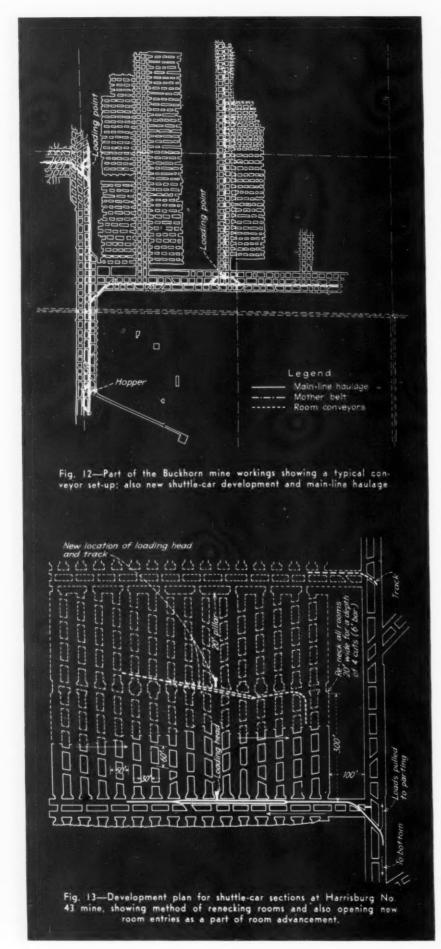
#### Men per Crew Varies

Crews at the track-and-car operations using caterpillar-mounted loading equipment normally vary from eleven to fifteen in number, excluding skeleton crews, although, due to overlapping cutting, drilling, etc., the time of some men may be split among two or more units. This also is true of repairmen, oilers, face bosses and others besides the basic crew membership for cutting, drilling, shooting, track, timber, loading and transportation. Ordinarily, one repairman, as an example, takes care of two loading units, but in one mine two men are assigned to seven machines and accompanying equipment. Drillers frequently tamp the holes and shoot them after the working shift, but in some cases special tampers and shooters are employed. quently, also, drillers do the bugdusting. Some operations, however, employ bugdusters who may do clean-up work, take down slate, etc. And at least one mine uses a slateman for two loading units. Kathleen power-shovel crews shearing-machine operators and "toppers" (to skim off the top layer of falls).

At mines with track-mounted loading machines, crews, except for two operations running 11 to 13 men, normally number 18 to 22 men. Many commonly use two serving locomotives behind machines and also lay more switches than the average mine using caterpillar-mounted equipment.

Timbering ordinarily is done with single posts, usually two rows on each side of the track (normally in the center), with as many more as may be necessary. At the face, the props are set in a V in which the loading-machine head works and are supplemented by safety posts during loading. Black Arrow





No. 18 mine, among others, also uses 12-ft. crossbars at the face where bad conditions are encountered. In Kathleen power-shovel sections, track is carried on one side while an 8-ft.-wide travelingway is maintained on the other. Consequently, timbering is based on two rows of posts between the track and travelingway (Fig. 7).

Use of two locomotives behind loaders by nearly half the track-and-car mines has correspondingly influenced track layouts. Consequently, connecting all rooms through all crosscuts at least once is a common, although not universal, practice. An exception is Valier, using 5BU, 7BU and 11BU equipment and driving rooms 250 ft. deep. Two locomotives (6- and 8-ton Jeffrey and General Electric cable reel units, plus combination battery and trolley equipment with Exide-Ironclad and Philco batteries) ordinarily are used behind five or six loaders and changing usually is done on the entry. In such cases, one is a reel and the other a combination unit, thus eliminating cable interference. One relay at Valier (10- and 13-ton Goodman, Westinghouse, Jeffrey or General Electric) normally takes care of two service locomotives.

#### Changing Done on Entry

Kathleen usually changes on the entry also, and, with a working height of about 7 ft. and a room depth of 250 or 280 ft., uses one Goodman 6-ton cablereel locomotive (a few with 8-ton equipment) behind a loading machine. These locomotives relay to the nearest sidetrack, generally constructed to serve four panels in accordance with general practice in the region. At Kathleen, a sidetrack normally serves two working and two developing panels. To facilitate operation, entrances to inside panels of a pair are reversed as in Fig. 6.

With the new panel plans shown in Figs. 3 and 4, both Orient mines will do practically all changing on the entry in the future; more particularly, on the stub entry off the regular panel entry, from which rooms 133 to 163 ft. deep are turned. With these room depths, picking up or connecting through crosscuts is not required for efficient changing.

At New Orient (Fig. 3), separate empty and loaded sidetracks are installed to serve four-panel groups. The empty track is placed in the outside of the three headings comprising the main or cross entry, while the loaded track is placed in a fourth opening especially driven. At Orient No. 1, however, the fourth opening in effect becomes a fourth heading and is widened to 18 ft. to accommodate two tracks. Also, the parting may be installed on either side of the main and partings also may be installed for a pair instead of four panels, etc., without driving an auxiliary opening.

When loading machines are served by single locomotives, the "key-room" system usually is employed, as at New Monarch, where working height is 7½ ft. and room depth 300 to 350 ft. Tracks in

three or four rooms on one side of a key room are picked up through approximately every other crosscut (Fig. 1), the pick-ups shortening changing distance. Track is left in a completed room close to the working places for car storage. Relay units haul to this room, where the main-line locomotive picks up its trip. New Monarch, using 5BU's operated by 15-man crews and changing 2.7-ton cars with single 7½-ton Whitcomb or Westinghouse battery locomotives (Exide-Ironclad and Gould batteries), also used for relaying, was averaging 310 tons per machine-shift.

Typical key-room operation prevails at Black Arrow No. 18 mine, where working height is 7 ft. and 5BU's are operated with 15-men-average crews. One room on each side of a center key room is picked up through each crosscut (Fig. 10) to cut changing distance. This mine also is one of several where loading machines are supplied with short rails with shoes for extending face track. Changing (3.7-ton cars) is done by single 5-ton Goodman 26-S reel locomotives. With big hills running grades up to 6 to 9 per cent and subnormal top conditions in many sections, production per loading-machine shift is 310 to 320 tons. Relaying is done by Goodman 8-ton reel locomotives slowed down to 4 to 5 m.p.h. for better operation on the hills.

#### Key Room Plan Adopted

A similar system is used at Peabody's Majestic No. 14 mine, where working height is  $7\frac{1}{2}$  ft. and 11BU machines are operated by 12- to 13-man crews. Cars holding  $2\frac{1}{2}$  tons are changed by single 6-ton battery locomotives (Exide-Ironclad and KW batteries) with relaying by 5-, 8-and 10-ton locomotives. Maximum relay haul normally is 1,300 ft. and partings are made by slabbing a heading on the main or cross entry. Average loader output at Majestic No. 14, all from room work, is 350 tons per shift.

With an average working height of 7½ ft. and rooms up to 300 ft. deep, Freeman Spur mine picks up the side rooms just once—about 135 to 150 ft. in. No relays are used, the main-line locomotives running to the room necks. Cars holding 2 and 2.4 tons usually are changed by single 6-ton Jeffrey, Westinghouse or Ironton locomotives (Exide-Ironclad and Gould batteries) with one machine served at times by two locomotives.

Room production comes largely from Jeffrey L-400 track-mounted loaders (12-man crews) while development falls mostly to 44-DD machines (usually six men). In changing behind L-400 machines, the small car plus a longer rear conveyor normally permits placing two cars per change. The practice is to load the first and then move out to load the second, whereupon both cars are stuck on the nearest available storage track, which may be the entry or an adjacent room. With this car and changing system, L-400 machines average 320 tons per shift, and one machine has

loaded as high as 746 tons in seven hours. Development machines (small crews) average about 170 tons per shift.

Track-and-car mines customarily connecting all room tracks through crosscuts ordinarily employ track-mounted loading machines, although not always. The exceptions include the Zeigler mines, where two-locomotive car-changing is the general rule. Both Zeigler No. 1 and No. 2 have a working height of 7½ to 8 ft. No. 1 employs 5BU, 7BU and 11BU equipment, the 5BU's being confined largely to development, which also is the practice at No. 2, using both 5BU and 11BU equipment. Standard crews, depending upon number of service locomotives, range from thirteen to fourteen men.

#### **Room Tracks Connected**

Practice at both mines, using 6- or 8-ton Goodman, General Electric, Jeffrey and Westinghouse locomotives, supplemented by a few Mancha storage-battery locomotives at No. 1 (Philco batteries), is to connect all room tracks by means of crossovers some 90 ft. in to the first switch (Fig. 5). Thus, when two locomotives are employed, one can use the room track and the other the crossover track, preventing cable interference. One locomotive, after storing its load, comes back to the switch and waits. Consequently, changing time is only that required for the waiting locomotive to get to the face. Standard room depth is 350 ft. Methods of moving up changing points in deeper rooms are shown in Fig. 5. Relay locomotives (6 and 8 tons) operate between storage tracks near the rooms being worked and doubletracked partings on the main or cross entries. Normally, one such parting serves four panels. Using mostly 4- to 5-ton cars, average output at the Zeigler mines is 335 tons per machine shift.

All rooms at Old Ben mines normally are connected through the first crosscuts substantially as in Fig. 8 to permit raising output by using two locomotives, at the same time eliminating cable inter-Working height normally ference. ranges from 7 to 8 ft., while standard room depth is 250 ft. Service locomotives usually are 6-ton Goodman, General Electric, Jeffrey or Westinghouse cablereel units, while relaying is handled by 6- and 8-ton cable-reel equipment, usually one to two gathering units, whether serving one or two loading machines. Service-locomotive speed is now being lowered, particularly at Nos. 11 and 14, as it has been found that this increases gathering capacity and is easier on controllers. Locomotives stay on the track better and maintenance cost is about one-third.

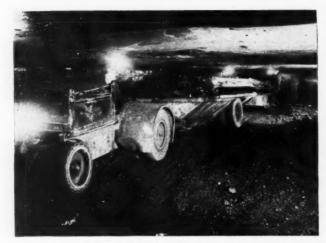
Old Ben loading units are built around Goodman 260-A and 360-A track-mounted loaders and generally are operated by 18-to 19-man crews, exceptions being the skeleton crews noted previously. Cars, depending upon the mine, hold from 3½ to 3½ tons. On this basis, average production from full-crew units runs from 400 to 500 tons at the four mines.

#### Two Locomotives Used

Using both track- and caterpillarmounted loading machines, Royalton No. 7 mine, with a working height of 71 to 8 ft., normally employs two gathering locomotives behind each machine (5-ton Goodman reel units and General Electric battery machines, Exide-Ironclad batteries). Ordinarily, one reel and one battery locomotive are used behind twolocomotive loading machines. machines are 10-ton Goodmans. In sections using track-mounted machines, all room tracks usually are connected Thus, a through every other crosscut. new changing point is provided about twice in a 300-ft. average depth. One locomotive normally uses the room track and the other the crosscut to prevent interference and speed changing. the first connections are made through



The elevating conveyor serving a shuttle-car section at Buckhorn is here shown filling an II-ton drop-bottom mine car.





Left is one of the original rubber-tired haulage units installed by the Blue Bird Coal Co. in 1936 and still using the original battery. The loader is handling No. 5 seam coal. Right is a later-type haulage unit coming in to the dumping station with 3 tons of coal.

the crosscuts, the switch and track is left in the neck of every third room for convenience in storing cars, parking equipment, etc.

Where caterpillar-mounted equipment is used at Royalton No. 7 the key-room system is employed, with a side room on each side being picked up from the center key place twice where room depth is 300 ft. Again track is left behind about every third place. Average car capacity at Royalton No. 7 is 3.85 tons and loading equipment includes Joy 5BU and 11BU and Goodman 260-A machines. Production machines, operated by 19 to 22 men, including supervisors and all extra labor, average 485 tons per shift, while development machines, with five-man crews, get around 135 tons per shift.

#### Cars Changed by Mules

Energy No. 5 mine presents an entirely different set of conditions and equipment, although the mining plan is essentially the same. With a small shaft and small car, this operation employs mules behind 7BU loading machines, a mechanicalmining unit normally consisting of two machines, two shortwall cutters, two drills and six mules. As at Royalton, development falls largely to skeleton crews. Room tracks are connected through every crosscut to form changing points near the faces where mules can pull in and wait for loaded cars to come When a crosscut track is moved up, the old one is torn out. Production machines average about 325 tons per shift, while development machines get about 100.

Among operations partly or completely on rubber-tired haulage or conveyor transportation are two in the No. 6 seam. The remainder are in the No. 5 seam in Saline County. Both the No. 6 seam mines are operated by the Consolidated Coal Co. With 740 ft. of cover and 5½ to 8½ ft. of No. 6 coal, part left to hold a weak gray shale, Jefferson No. 20 (formerly Nason) was

reopened in 1938 with Goodman shortwalls (Joy caterpillar trucks), Chicago Pneumatic post-mounted electric drills, Cardox, Joy 7BU loading machines, 6½-ton Joy shuttle cars (two per loading machine) powered with Exide-Ironclad 300-amp.-hr. batteries and Joy elevating convevors.

Basic crew members for a unit comprise a loading-machine operator and helper, two cutters, one clean-up man and dust handler (assisting cutting crew), two drillers, who also bugdust, one shotfirer and examiner, and two shuttle-car drivers. One "blocker" spots mine cars under the elevating conveyor and sometimes can take care of coal from two loading units. At the time of the Coal Age survey, all units at Jefferson No. 20 were engaged primarily in driving entries and all employees except shotfirers were being hoisted just before lunch time and let down afterward while places cleaned up in the forepart of the shift were being shot. In spite of these handicaps, production per loading-machine shift was averaging 300 tons.

#### Seven Rooms in Territory

Under the Jefferson No. 20 system (Fig. 9), a shuttle-car "run" usually consists of a minimum of four 12-ft.-wide main headings, plus crosscuts; five panel headings, plus crosscuts; or seven rooms 22 ft. wide on 70-ft. centers and 500 ft. deep, one room being the key opening from which haulage branches off to the side rooms. When the rooms are driven up, the 48-ft.-thick pillars are split on the retreat to increase recovery.

In development, shuttle-car loading points are placed at the mouth of each panel entry, with normally an intermediate point between. In starting a panel, the usual practice is to drive the main ahead to the intermediate station and then while track is being laid up, etc., drop back and work the panel entry. Before a main's unit quits a

panel it is supposed to have driven it in far enough to install the first two loading points, with sufficient distance ahead for rooms for a loading unit on either side, with a third advancing the five headings if desired. Loading stations are built as the advance comes to them, even if they are not to be used immediately, and the tracks are arranged (Fig. 9) so that, depending upon grades, empty trips may be dropped through in either direction. All crosscuts are driven on 60-deg. angles and, with a few necessary exceptions, are designed to lead the shuttle units to the loading points by the nearest routes. Maximum haul in room work is around 1,000 ft., while the average is about 600 ft.

#### Conveyors Carry Coal

A similar shuttle-car unit operating under substantially the same plan has been installed in Buckhorn mine, a beltslope operation started in 1937, to supplement the original conveyor system. Main openings at Buckhorn, where the working height is around 7½ ft., consist of four headings 12 to 14 ft. wide on 55-ft, centers. Panels in conveyor sections are opened by three headings on 60-ft. centers, with a gathering belt and a supply track in the center. After installation of the gathering belt, panel headings are driven as the rooms are advanced. The standard panel runs 40 rooms on a side. Room width is 24 ft.; centers, 52 ft.; depth, 300 ft. The practice (Fig 12) is to work rooms on one side as the entry advances and then retreat on the opposite side.

Equipment for a conveyor section (eight rooms and three headings) includes two Joy 8BU loaders, one in rooms and one in headings; two Sullivan 7-B "Super" shortwall cutters with Joy T-1 caterpillar transfer trucks, one in rooms and one in headings; eleven Joy 20-hp. 15-in. chain-type room conveyors (6-ft. pans); two 75-ft. 7½-hp. chain-type cross conveyors for use in headings; and one Joy 40-hp. 30-in. belt-

type gathering conveyor (6-ply 42-oz. Goodyear belt) extensible to 2,500 ft.

The crew for such a section may aggregate the equivalent of 121 men, as follows: two loading machine operators, two helpers, two cutters, two drillers, one tamper, two panmen extending conveyors and doing other work, one-half repairman and one utility man. At times, one loader operator and one helper may operate both the room and entry loaders. Room conveyors are centered with a row of props along one side. When rooms are completed, the coal along the untimbered side is loaded by machine-by hand on the timbered side, after which the conveyor is removed and the timber recovered as far as possible.

The gathering belt, taking coal from the chain conveyors and placing it in Sanford-Day "1-2-3-4" drop-bottom cars, is extended about every 500 ft., one chain conveyor relaying from a second unit in the center heading, onto which the two side conveyors discharge through cross conveyors. A special batterypowered truck (see p. 132) handles supplies from the inby end of the supply track. With both conveyor and shuttlecar runs operating, Buckhorn production, at the time of the Coal Age survey, was 350 to 450 tons per machine-shift.

#### First Use of Rubber Tires

Having pioneered James H. Fletcher's rubber-tired haulage idea in 1936, the Blue Bird Coal Co., a Saline County property, now operates the new Blue Bird No. 6 mine. This property, also served by a belt slope, retains the principle of main-line conveyor transportation used in the first rubber-tired operation. The original rubber-tired haulage equipment, with additions, still is in service. The No. 5 seam, averaging 4½ ft. under about 125 ft. of cover, is recovered. Over the seam is 2 to 3 in. of drawrock, which comes with the coal and mostly is loaded out for removal in the surface preparation plant.

Haulage units (Baker-Raulang tractors - Exide-Ironclad batteries - pulling Sanford-Day drop-bottom trail cars) dump into Barber-Greene sectionalized steel hoppers with feeders suspended in pits in the mine bottom. The normal pit is 10 to 12 ft, wide and has a maximum depth of about 12 ft. It is entered by an 18-deg, incline at one end accommodating the feed end of the main-line conveyor. A plank floor resting on timber posts and crossbars (see accompanying illustration) covers that part of the pit and incline over which the haulage units operate. At the time of the Coal Age survey, two main-line conveyors-30-in. Barber-Greene units 600 ft. long and equipped with 15-hp. motors and Goodyear belts-were operating in tandem from one dumping station to the slope-conveyor system.

Maximum rubber-tired haul at Blue Bird No. 6 normally is kept under 1,000 to 1,200 ft., beyond which hopper, feeder and main-line belts are moved ahead. When small outlying areas of coal are encountered, however, the haul may be stretched to 1,500 ft. or more, inasmuch as the small tonnage would not warrant the expense of moving up. With these limits on the haul and the thickness of coal prevailing, average output per machine shift with crews of around eleven men per unit, is about 250 tons.

A production unit consists of an 8BU loader, Dooley 473 drill, three buggies and the equivalent of one cutting machine, although with the addition of one more new 50-hp. Goodman 512 universal shortwall cutters ordinarily will be able to take care of more than one loading machine. Crews, on the basis of one cutter per unit, are made up, ordinarily, of a loader operator and helper, cutter and helper, two drillers, who also load holes and shoot; one jerryman, who also takes care of timber-ing; and three buggy runners. For the entire mine, one extra man, one elec-trician, one foreman and two examiners

are employed.

Development at Blue Bird No. 6 is based on main entries of five 15-ft.-wide headings on 40-ft. centers. These mains, under the present system (Fig. 11), are paralleled on each side by rooms. Rooms are entered through openings in a 40-ft. "barrier pillar," these openings and the room crosscuts being driven in line to facilitate haulage to the dumping station, or "ramp." The five entry headings normally will be kept some 400 ft. ahead of the rooms so that in case of trouble in a regular room territory, a new one can be opened up immediately



In the background in this illustration are the pit hopper and feeder which receive the coal and place it on the main-line belt at Blue Bird No. 6. The posts and crossbars support the plank floor on which the rubber-tired haulage units operate.



Here a shuttle car is receiving a 6-ton load of No. 5 seam coal in Harrisburg No. 43 mine.

by going ahead and turning rooms crosswise off the entry.

Cross, or room, entries are eliminated under the Blue Bird system. Instead, when rooms, 27 ft. wide on 42-ft. centers, reach 300 ft. they will be renecked 15 ft. wide for a distance of 30 ft. and then widened out again. In other words, rooms will be continuous, with renecking at 300-ft. intervals to form protective blocks against squeezing.

#### Shuttle Cars Adopted

As a result of shuttle-car installations starting late in 1939, two Saline County mines of the Peabody Coal Co. (Harrisburg 43 and Harco 47) now are recovering the No. 5 seam with a combination of track-and-car and rubber-tired-haulage In track-and-car operations at Harrisburg No. 43, using 7BU loading machines, units are made up of one loader, shortwall cutter, drill and slowspeed (about 4 m.p.h.) locomotive, with one relay locomotive serving two loading units. Normally, a track-and-car machine unit is operated by a 13-man crew, with development crews running as low as three men. Harco 47 employs 5BU and 7BU equipment in track-and-car territories, the unit make-up and crew being substantially the same as at 43, except that full-sized development crews ordinarily are employed. The development plan at both 43 and 47 is substantially similar to that previously outlined for Black Arrow No. 18, including "bull gangs.

Coal thickness at Harrisburg 43 varies from 4½ to 6½ and averages about 5 ft.

About 4 to 18 in. of drawrock overlies the coal most of the time, above which is shale. Coal thickness at Harco 47 ranges from 4 ft. 4 in. to 7 ft., and the top varies from good gray slate through rotten sandstone, shale and other materials. Mine cars at Harrisburg 43 hold 2½ and 3 tons, while the capacity at Harco 47 averages 3.15. Under these conditions, production from track-andcar development machines at Harrisburg 43 is around 100 tons; from production machines, around 220 tons on the average. Track-and-car machines at Harco 47 range from 250 to 340 tons per shift, with the average around 275 tons.

Four shuttle-car units were in service at Harrisburg No. 43 at the time of the Coal Age survey. Each consisted of a 7BU loader, one shortwall cutter with Joy caterpillar transfer truck, one postmounted electric drill and two Joy 6-ton shuttle cars, supplemented by a Joy elevating conveyor. Shuttle-car units are operated by 16-man crews, one of the extra men being a bugduster, who also handles about 6 in. of coal which occasionally falls after the cut. In track sections, drillers bugdust the cuts. With shorter cutter bars, Harco 47 normally includes two cutting machines in a shuttle-car unit: also two drills. Two of the Harco units are built around Joy 14BU loading machines, with the third around a 7BU. Crews run fifteen to sixteen men. Average production per shuttle-car unit per shift was running 500 tons at Harrisburg 43. At Harco 47, the range was 400 to 550 tons per machine-shift, with the average about The working plan developed for shuttle cars at Harrisburg 43 (Fig. 13) provides for sixteen places 30 ft. wide on 50-ft. centers, for renecking rooms once between room entries and for driving entries as a part of room advancement instead of separately. Thus, advance will be continuous and a separate development cycle for room entries will be eliminated. A similar system has been installed at Harco 47.

#### Elevator at Room Mouth

Under the Harrisburg 43 plan, the car-loading elevator is installed at the mouth of a room near the center of the group and discharges into cars on one side of a two-track parting. To get shuttle-car haulage off the entry as soon as possible, the first crosscuts are driven as shown in Fig. 13, thus putting haulage in the room crosscuts at the earliest possible moment. After the places are driven in some 300 ft., the rooms are narrowed down and renecked and the car-loading elevator and parting moved up. The one-way haul from the farthest working place just before the move-up thus is about 700 ft.

With the car-loading elevator and parting moved up, room advance continues until the proper distance for a new entry is reached. At this point, every other room is stopped and the remainder are narrowed to form protective pillars. The narrow rooms are cut together to form the new entry aircourse, crosscuts are driven, the haulway is cut together between crosscuts and new rooms are necked.

## FACE PREPARATION

# Southern Illinois Deep Mines

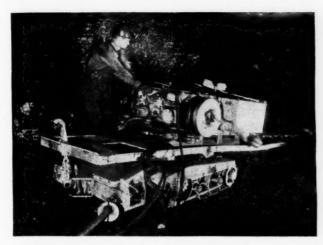
ONG cutter bars and permissibles, carbon dioxide, air and hydraulic pressure feature face preparation and coalbreaking at southern Illinois mechanical With some 250 loading machines mines. in service, the 23 deep mines in Franklin, eastern Jackson, Jefferson, eastern Perry, Saline and Williamson counties covered in the Coal Age survey also were operating some 260 cutting machines. With loading-machine output averaging over 300 tons per shift and with several operations regularly getting 450 to 500 tons or more, the number would be substantially higher except for several com-

pensating factors. One, of course, is operating cutters more than one shift, although not a common practice. Another is the 7- to 9-ft. mining thickness at the majority of the mines, increasing the tonnage per fall. Some 42 trackmounted machines, with their usual higher capacity, plus new higher-capacity shortwalls, keep down the total.

Measures to increase coarse-coal output or loadability, or both, include snubbing shots, shearing and use of carbon dioxide, air or hydraulic pressure plus, in one case, modified cushion blasting and in another a combination of carbon

dioxide and powder. Cardox coal-breaking was pioneered in 1926 at an early Blue Bird operation in Saline County. The "Energy Air Miner," predecessor of present air breaking equipment, was developed at the Royalton No. 7 mine, Franklin County Coal Corporation, in 1930. And the du Pont hydraulic mining process was brought to a. semi-commercial stage in the New Monarch mine, Consolidated Coal Co., starting in 1938.

As cutting seldom is easy, practically all mines in the region use either throwaway bits or standard bits tipped with borium, tungsten carbide, etc. In addi-





Unloading a shortwall from caterpillar truck, Buckhorn mine.

New-type shortwall machine at work in heading in Valier mine.

tion to economies in labor, bit steel and the like, throwaway or hard-surfaced bits also save in bit-setting time, reduce power consumption and lower machine maintenance. Except for one unit, all drills are post-mounted. Conveyor-type augers are widely used and all augers normally carry heads accommodating throwaway bits. Many advantages cited for machine bits also apply to throwaway drill hits.

Outside of five Saline County operations in the No. 5 coal, mines in the Coal Age survey recover the Illinois No. 6 seam 5 to 12 ft. thick. Usual mining height is 7 to 9 ft. Top coal left to help support the shale roof normally is governed by a natural parting near the top. Usually, also, some 4 to 6 in. of coal is left on the bottom to keep loading machines out of the fireclay. In some mines, however, this bottom is channeled when the track is extended.

#### No. 6 Carries "Blue Band"

The No. 6 seam in southern Illinois carries the characteristic "blue band" normally 18 to 30 in. above the bottom (one-fifth the mining height in many cases). The blue band varies from bony through slate and shale to clay. Its presence, plus the relatively great working height, has dictated snubbing shots or rounds to break the band and lower bench and thus aid the top shots. And as the blue band frequently occurs at about the height the loader gathering mechanism works, snubbing shots also serve to break up this point of resistance.

Mines in the No. 6 seam using shortwalls and powder normally employ six to eight holes in breaking down a 24- to 30-ft.-wide room face. At New Monarch, where 1\(^2\)x6-in. du Pont "Lump Coal C," with Gelobel occasionally in wet holes, is used in all but the hydraulic-breaking section, the standard is eight holes drilled about as in Fig. 1. Chicago Pneumatic 472 and 474 drills with Hardsocg augers, heads and bits are employed. Cutting is done by Sullivan CE-7 machines. Most of the cutter bars are

8½ ft. long, with a few 7½. Bits have been tipped with Stellite for six or seven years and experiments with Haystellite are under way. A maximum of two regrinds is obtained before hard-surfacing renewal. Four drill set-ups are made in a 28-ft.-wide place and holes normally are drilled straight in, with the bottom round about 20 in. over the blue band. Usual charge is 3½ 7-oz. sticks per rib hole and three per center for a place yielding about 60 tons.

The drilling pattern at Consolidated's neighboring Buckhorn mine is substantially similar, except that room width is 24 ft. Consequently, rib holes usually are shot with three instead of 3½ sticks of "Lump Coal C," with two in the center holes. Top holes are drilled about 18 in. away from the rib; bottom holes about 12 in. Cutting is done with new Sullivan 7-B "Super" shortwalls with 8½-ft. bars transported on Joy T-1 caterpillar trucks. Bit-tipping is the same as New Monarch.

#### Bits Tipped After Use

Cutting equipment at Valier mine, Valier Coal Co., comprises Goodman 324-AA track-mounted and Goodman 512, Sullivan 7-B and Goodman 12G3, 112G3 and 112G3A shortwalls. Cutter-bar lengths are 6½, 7½, 8 and 8½ ft., the latter on the newer shortwalls. Bits are tipped with Borod after each use rather than regrinding, primarily on the ground that it increases square footage cut. Drilling is done with Chicago Pneumatic 472 and 574 post-mounted drills and one Jeffrey double-spindle track drill. Dooley augers and heads with Hardsocg bits are employed. The coal-breaking medium is 1¾ x 6-in. "Lump Coal C," plus some Gelobel in wet work.

Valier uses various drilling plans for special conditions and various depths of cuts. With long bars, however, the 7-hole plan shown in Fig. 2 generally is employed. In some cases, eight holes may be used, with the bottom round drilled about the same as the top. Normally, however, the seven holes are drilled from three set-ups, with the rib

holes and the center bottom hole straight in and the two middle top holes angled

Variations at Valier include a six-hole plan in which part of the top holes are drilled from one rib set-up, one along the rib and one angling to the center. Then, from the opposite set-up, two more top holes, plus two holes over the blue band, are drilled in the same fashion. In narrower places, such as 24 ft., another plan is three holes straight in the top and another three straight in over the blue band. Bugdusting is done by a separate man working with the drill crew, the latter loading and tamping holes. Each place is sprinkled before shooting.

#### Five Holes Used in Rooms

Five holes from three set-ups normally break down a 24-ft. face at Black Arrow No. 18 mine, Peabody Coal Co. Here, Goodman 12-AA shortwalls with 6-ft. bars are supplemented by one 324-AA track machine with 9-ft. bar. Sulphur, rock and other foreign materials make for hard cutting. About one-third of the machines use the Goodman Type 64 chain and throwaway bit, plus one Prox "Tool-Steel" chain and bits. The rest use standard bits tipped with tungsten carbide by Cutter Bit Service under an arrangement whereby all the mine does is take the bits in, use them and bring them out for exchange. Dooley (CP) 473 post drills are employed with "Herco No. 2" fairly slow permissible running about 92 13x6-in. sticks per 50-lb. box.

Typical drilling patterns for 24-ft. rooms and 12-ft. headings at Black Arrow No. 18 are given in Fig. 3. Three of the five holes in rooms are drilled straight in the top, with the others angling out from the center over the blue band. With a 24-ft. place making about 45 tons, usual loading is 1½ to 2 sticks. In headings, the four holes are drilled from two set-ups, with the bottom holes angling in as in Fig. 3. Drillers bugdust, tamp holes and shoot after the working shift.

Snubbing at Peabody's Majestic No.
14 mine involves shooting down the coal

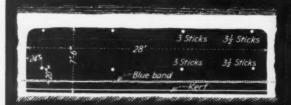
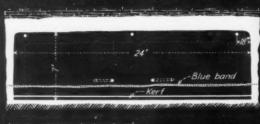


Fig. 1—Room-drilling pattern with powder shooting. New Monarch mine.



12'

Fig. 3—Usual drilling plans for rooms and headings, Black Arrow No. 18 mine.

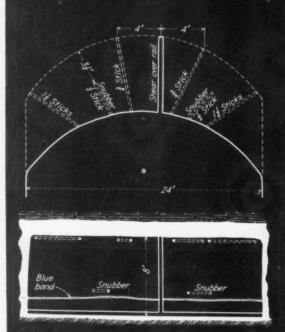


Fig. 5—Drilling plan for a sheared place, Orient No. 1 mine, showing short snubbing holes.

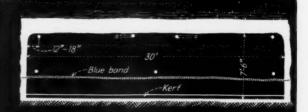


Fig. 2—Usual room-drilling plan with long cutter bars, Valier mine.





Fig. 4—Usual drilling plans for rooms and headings. Majestic No. 14 mine.

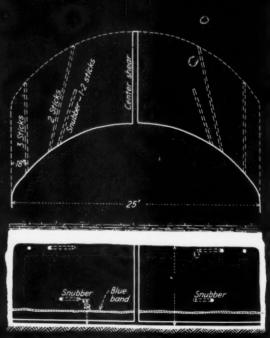


Fig. 6—Drilling pattern for a center-sheared place with short snubbers, New Orient mine.



Universal machine making a center shear, Freeman Spur mine.



Slabbing machine at work in a room in Old Ben No. 15 mine.

under the blue band and cleaning it out on the night shift. Sullivan standard shortwalls with 6-ft. bars and two Jeffrey 29-L track machines with 8-ft. bars and Jeffrey "Star" bits and chains are employed. Bits are supplied by Cutter Bit Service. Dooley (CP) 473 drills are used, with "Coalmaster" augers, cuttingheads and bits. The coal-breaking medium is Alton "Big Red" No. 7-C permissible, around 100 sticks per 50-lb. box.

#### Snubbing Holes Included

Two snubbing holes directly under blue band are included in the typical drilling pattern for a shortwall-cut 24-ft. room (Fig. 4). In a 12-ft, heading, one snubbing hole with two top holes usually are drilled, with occasionally a center hole in the top. Two set-ups generally are made in rooms, with the top rib holes angling out to break the coal clean in the corners and with the center holes. both top and snubbing, angling toward the center. Coal from the snubbing shots is cleaned out on the night shift. The usual wide place, making about 40 tons of coal, is shot with eleven to twelve sticks. Drillers and shooters bugdust, drill, load holes and shoot after the shift.

Mines shearing and using powder include Orient No. 1 and New Orient, Chicago, Wilmington & Franklin Coal Co.; Kathleen, Union Colliery Co.; and Freeman Spur, Seymour Coal Mining Co. Orient No. 1, in addition to CE-7 shortwalls with 7½-ft. bars, also uses Jeffrey 29-LE and Sullivan CLU cutting and shearing machines with 8½-ft. bars and hydraulic feed and controls. Prox "Tool-SteeL," Cincinnati "Duplex" and Jeffrey "Star" bits and chains are used in addition to standard bits supplied by Cutter Bit Service. Dooley (CP) 473 and Jefrey A-6 drills with Dooley augers, Hardsocg heads and Dooley and Hardsocg bits are used. Drillers and shooters bugdust, drill, load holes and shoot after the shift.

Places are sheared over one rail and

short snubbing holes knock down the bottom bench at Orient No. 1. All holes are drilled from one set-up in a sheared place about as in Fig. 5. The bottom snubbers are drilled short to center the charge over the bottom bench on each side. Approximately  $5\frac{1}{2}$  to 6 sticks of powder (Burton A in 10-oz.  $1\frac{3}{4}$ x6-in. sticks) break down a 24-ft. place making about 50 tons.

CE-7 machines with 7½-ft. bars are supplemented by CLU hydraulic and 7-AU cutting-and-shearing machines with 10-ft. bars at New Orient. Chicago Pneumatic 700 drills are fitted with "Coalmaster" augers, heads and bits. The explosive is 1½x6-in. Lump Coal C. A 2½-to 2½-in. hole is drilled and supplemented on occasions with a 6-in. air space in front of the charge for cushioning. This practice was adopted some years ago, primarily to increase coarse-coal output and also improve loadability. Four cutting machines are fitted with Cincinnati "Duplex" chains and bits. The remain-

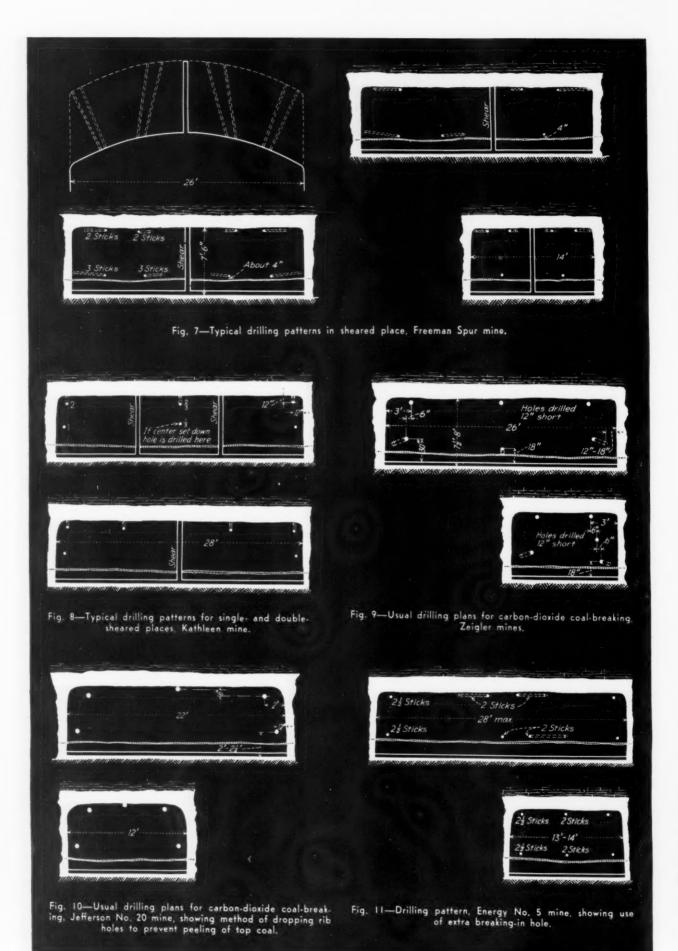
der use standard bits tipped with Borod. Normally, such bits are reground twice before retipping.

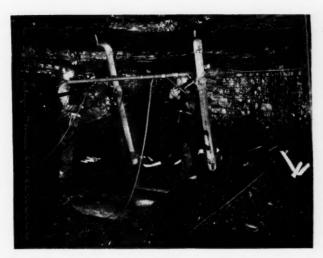
The drilling pattern for CLU places at New Orient is substantially the same as for Orient No. 1 (Fig. 5). The 7-AU machines, however, shear in the center and such places are shot with six holes (Fig. 6). The bottom snubbers (one or two sticks) are ended at the center of each half cut. Top rib holes take three sticks, with two in the centers. On this basis, some 6 to 7 lb. of powder breaks down a 25-ft. place making about 75 tops.

Cutting at the Freeman Spur mine, Seymour Coal Mining Co., is done by two Jeffrey 29-U universal machines with 9-ft. cutter bars and two 29-LE units with 8-ft. bars, using especially hardened Jeffrey "Star" bits. Chicago Pneumatic 472 and 474 and Jeffrey A-6 post drills are employed with "Coalmaster" and Hardsocg augers and "Coalmaster" cutting heads and bits. The explosive is



Powder-shot fall of No. 6 coal, New Monarch mine.





Operating two drilling units together in a room, Royalton No. 7 mine.



Carbon-dioxide tubes being placed in the face in Old Ben No. 15 mine.

1\(^4\xext{x6-in.}\) Alton "Big Red" No. 7-C. Average production was 3.98 tons per pound in 1938.

The 29-U machines shear in the center and the 29-LE over the rail. In a 29-U room 26 ft. wide, averaging about 50 tons, four holes are drilled on each side (Fig. 7). The usual practice is to work two drills together. Meantime, a tamper bugdusts the cut and gets ready to load the holes, using Ensign-Bickford safety fuse. Bottom holes normally are loaded with three sticks to insure breaking the lower bench, with two in the tops for coarse-coal production. In a '29-LE place, the plan is the same on the wide side. Three holes are drilled on the narrow side, one top hole angled over sufficiently to insure breaking to the shear. The bottom hole is drilled straight in about 4 in. over the blue band. Headings 14 ft. wide usually are shot with six holes (Fig. 7).

#### **Shearing Machines Used**

Goodman 12-A and 12-AA shortwalls with 7- and 9-ft. bars are supplemented at Kathleen mine, Union Colliery Co., by three Joy caterpillar-mounted and three Goodman and three Sullivan track-

mounted shearing machines. Cutters with 9-ft. bars are used in power-shovel sections (p. 78). Four Prox "Tool-SteeL" chains were in service at the time of the Coal Age survey. Standard bits are tipped with Haystellite and ordinarily three regrindings are possible before retipping. Results include about twice the tonnage before bits must be reset. Over-all bit cost is about one-fourth. Chicago Pneumatic post drills are used. The explosive is 1\frac{3}{4}x6-in. Duobel.

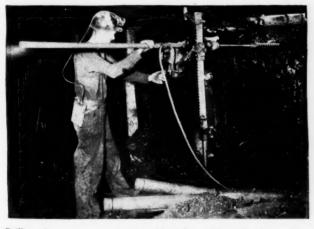
Two shear cuts (Fig. 8) are made with caterpillar equipment. Five shotholes are drilled and loaded with six to seven sticks of powder (about 8 oz. per stick) in winter, when the aim is just to crack the coal for the power shovels. A 28-ft. place makes about 50 tons cut about 8 ft. deep. If the center portion sets down, a hole is drilled to crack it up. With track-mounted shearing equipment, one shear is made in the center and six holes are drilled (Fig. 8). Ten to twelve sticks of powder are used in winter, the extra being necessary for greater breakage in such places, inasmuch as different loading equipment is used, and also because only one shear

cut is put in. Headings 12 ft, wide making about 22 tons are center-sheared and shot with four holes.

Among No. 6 seam operations using Cardox are the two Zeigler mines, Bell & Zoller Coal & Mining Co., employing Jeffrey 35-B and 35-BB shortwalls with 8-ft. cutter bars and Chicago Pneumatic post-mounted drills. Drill crews finish bugdusting places after the cutters and also place and wire Cardox tubes. Cutting machines use standard bits tipped with "Stellite" or "Sulite."

#### Snubbing Shots Angled

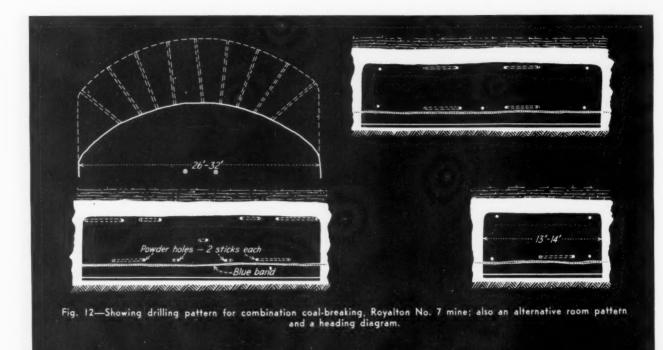
As the charge per hole cannot be varied with Cardox, closer attention is given to cutting and hole placement to equalize burden and eliminate resistance. While some latitude is granted, the usual hole plans for rooms and headings are shown in Fig. 9. Rooms 26 ft. wide are broken with six holes normally drilled 12 in. short. The three snubbing holes are angled slightly down to assist in turning over and rolling out the lower part of the cut. Where the coal is inclined to sag or fall, a sprag is placed under the center hole. Headings 12 ft. wide are broken with five holes zigzagged about

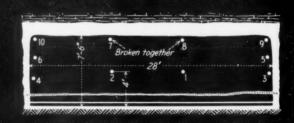


Drilling for a new crosscut in Harrisburg No. 43 mine, using carbon-dioxide tubes.



Cutting with a new a.c. shortwall-type machine in No. 5 coal, Blue Bird No. 6 mine.





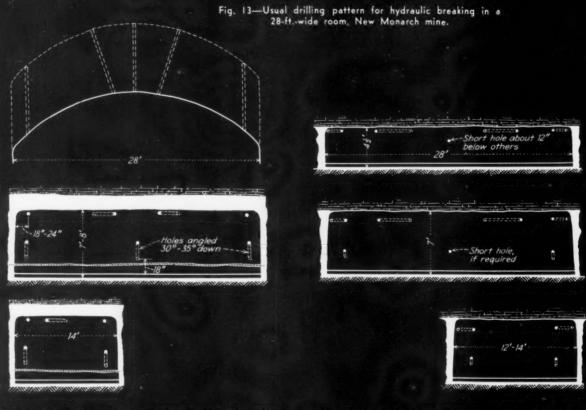


Fig. 14—Usual drilling plans for carbon-dioxide coal-breaking, Fig. 15—Usual drilling patterns for carbon-dioxide coal-breaking, Harco No. 47 mine.

as in Fig. 9. As the holes are shot from bottom to top, each relieves the next. Tubes are loaded with 6½ lb. of carbon dioxide and the average per tube runs 6.80 tons at No. 1 mine and 6.73 tons at No. 2.

Peeling of top coal with Cardox largely has been eliminated at Jefferson No. 20 mine, Consolidated Coal Co., by dropping top rib holes some 6 in. Emphasis is placed on sumping square and drilling top holes straight in instead of gripping to reduce the tendency of the gas to work up. Cutting is done by Goodman 512 shortwalls with 9-ft. bars (Type 64 chains) and drilling by Chicago Pneumatic drills with Hardsocg conveyor-type augers. Cutters are moved on Joy caterpillar trucks. Cardox 231-130 tubes are loaded with about 6 lb. of carbon dioxide. Rooms 22 ft. wide normally are broken with five holes (Fig. 10). Five holes are used in headings, with four when conditions permit. The principal job of the bottom holes is to break the blue band and roll out the lower bench.

#### Coal Cut by Slabbers

Except for one Sullivan CLU, all four Old Ben Coal Corporation mines are equipped with Goodman 324-AA trackmounted slabbing machines. The changeover to slabbers started in 1929. Equipment eliminated included breast ma-Present machines are being chines. equipped with 8½-ft. bars accommodating standard chains and bits. Some bits are obtained from Cutter Bit Service but the majority are tipped with "Haystellite' in a central bit-treating plant at No. 8 mine. Present practice was arrived at some six or seven years ago. In addition to increasing coal cut per point and reducing power consumption and maintenance, tipping also has decreased bit cost. In 1937, the four Old Ben mines produced 2,413,000 tons. Total bit cost was \$7,084, including repairs and additions to sharpening equipment. Labor cost only was \$4,376.

Tests on Cardox were started in 1930 and next year the medium was adopted 100 per cent. Results include more lump and less degradation in shipping. As compared with powder, Cardox reduced the output of minus 2-in. coal about 10 percentage points. Lump was increased in the same proportion with no great change in the intermediate sizes.

Rooms 28 ft. wide normally are broken with seven holes. The three snubbing holes to break the blue band and roll out the bottom are angled downward for greater effect, while top holes are drilled level (Fig. 14). Headings 12 ft. wide may be broken with either four holes (two on each rib) or five (Fig. 14). Rooms usually make 45 to 50 tons, with headings around 20 tons. Cardox tubes (3½-in. 100-cu.in. low-pressure units) normally carry about 6 lb. of carbon dioxide.

In addition to straight powder, Royalton No. 7 also uses a combination of powder and Cardox at times for maximum

loadability and coarse-coal output. Powder smashes the blue band and lower bench to reduce digging by the loading machine, while Cardox in the top holes gives a good roll and maximum coarse coal. This same principle is followed with powder.

Cutting is done by two Goodman 324-AA slabbing machines supplemented by Goodman universal shortwalls. Bits are hard-surfaced, Franklin County Coal being the first to adopt this practice in the region in 1929, using borium. Normally, bits are reground about five times before retipping. Dooley (CP) post-mounted drills usually are worked in pairs, changing off between large- and small-diameter augers. The explosive is 1\frac{3}{4}x6-in. Monobel C.

#### Two Drills Make Holes

A typical slabber-place drilling pattern is shown in Fig. 12. The two drills are set up at the rail ends to put in three or four top holes, a middle breaker and four holes over the blue band. In combination shooting, bottom holes normally are loaded with two sticks of powder and the rest with Cardox. The drill crew bugdusts and loads holes. An alternative drilling plan (three set-ups) also is shown in Fig. 12, along with one heading plan.

Energy No. 5 mine (same company) uses Cardox eight months (in times of good lump demand) and permissible the rest of the year. Typical room and heading drilling plans (Goodman universal

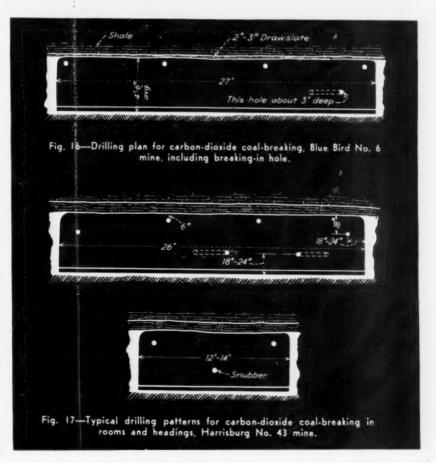
machines with 7½-ft. bars, Dooley drills) are given in Fig. 11. The angle hole above the blue band (drilled either direction) provides extra breakage where the loading machine goes in.

#### Coal Broken Hydraulically

Hydraulic breaking developed in one section of the New Monarch mine (April, 1940, Coal Age, p. 67) uses oil pressure supplied by a pump designed to change automatically and instantaneously from high pressure and low delivery to high delivery and low pressure. The oil inflates tubes with rubber cores and braided-wire-mesh coverings designed to lock automatically and stop expansion at a certain limit. Unexpanded tube diameter is approximately  $4\frac{3}{4}$  in., and to accommodate it  $5\frac{1}{4}$ -in. holes are drilled with a special auger with a pilot bit to insure a straight hole.

Ten holes normally are drilled in a 28-ft. face. Approximate hole placement is shown in Fig. 13, also giving the breaking order. Sprags provide the necessary resistance and insure proper fracture. A unit is operated by two men, and one, for a period of months, regularly broke coal for two loading machines each producing 300 to 320 tons per shift.

With somewhat thinner coal, No. 5 seam mines surveyed find that in general they can do a good job of breaking with fewer holes. Having pioneered Cardox, the Blue Bird Coal Co. plans to use stationary Airdox this coming winter, installing the compressor on the



surface and taking air lines down to the working sections through drillholes. The Airdox plan will be substantially similar to Cardox drilling plan for a 27-ft. place shown in Fig. 16. In both, a short hole on one side breaks the bottom of the fall to let the loading machine work in. Cutting at Blue Bird No. 6 is done by two Goodman 512 shortwalls with 72-ft. bars (a third to be installed), supplemented by Sullivan CE-7 equipment. Dooley (CP) 473 drills with Hardsocg augers, heads and bits are used for drilling. The explosive, when used, is 13x6-in. Monobel C. Hard-surfaced bits are obtained from the Auto Machine Co.

With Cardox D-100 tubes for coalbreaking, Harrisburg No. 43, Peabody Coal Co., uses Goodman 12-AA, Jeffrey 35-B and Sullivan CE-7 shortwall cutters and Dooley (CP) 472 and 473 and Jeffrey A-6 drills with Hardsocg augers making 34-in. holes. All cutting machines are being equipped with 82-ft. bars and

chains accommodating throwaway bits. including Cincinnati "Duplex" and Goodman Type 64. Each crew in a shuttlecar section includes a bugduster. Drill crews clean the cuts in track sections. Typical drilling plans for rooms and headings are given in Fig. 17. Snubbers on one side in rooms and approximately the center in headings make it easier for the loading machines to work in, in addition to relieving top holes and increasing coarse sizes. Rooms making about 50 tons are broken with six holes; 20- to 25-ton headings with three.

Cardox also was adopted at Peabody's Harco No. 47 mine in 1938 to make a firmer coal. Originally, 100-cu.in. tubes were used. These have been displaced by 200-in. units to increase breaking force for deeper cuts, etc. Cutting at Harco 47 is done with Jeffrey 35-B and 35-BB shortwalls. Bars are being changed to 8½ ft. and chains include Jeffrey "Star" and Cincinnati "Duplex." Standard bits are supplied by Cutter Bit Service. Drilling equipment comprises Dooley (CP) 473 drills and Hardsocg

augers, heads and bits.

Five Holes Used in Rooms

Rooms 28 to 30 ft. wide in 42-ft. coal are broken with five holes, one a halflength snubber to knock down the center front and relieve the regular top holes. Three holes are drilled in headings. Six holes, plus, on occasions, a short snubber, are used in 7-ft. coal (Fig. 15), where cuts make about 35 tons. In headings in this thickness of coal, the standard is four holes.





# TRANSPORTATION Southern Illinois Deep Mines

ARGE outputs and long producing histories characterize most southern Illinois deep mines. Shaft operations predominate and with few exceptions (Freeman Spur mine, Seymour Coal Mining Co., and Kathleen mine, Union Colliery Co.) divide underground haulage into gathering, relay and main-line. Many mines necessarily use small cars because of low coal or small shafts from hand-loading days. However, several skips are in service. New mines have New mines have been equipped with 15- to 172-deg. slopes

fitted with 26- to 54-in. rubber belts. Main hauls at shaft mines, generally employing one or two dispatchers, seldom are less than a mile and in many cases run up to 31 miles. All cages, many made at the mines, are self-dumping, while overturning skips are installed. Steam is the most used hoisting medium (Table I).

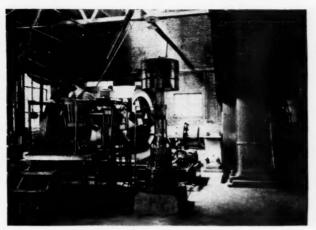
Mines using skips employ rotary dumps. At Kathleen mine, Union Colliery Co., a 2-car 1/2-over air-operated Wood rotary is in use. An Allen & Gar-

cia air-operated butterfly door feeds the skips. Before entering the dump, cars are weighed by two Winslow scales. Skips are rated at 11 tons, compared with the original 8-ton figure. The extra capacity is needed because newer steel mine cars hold 4.75 tons, compared to the 3.75 tons for the old, and was gained by welding an 18-in. lip on the skip.

A single-car 360-deg, rotary dump is part of a complete electrically operated Roberts & Schaefer installation, including automatic non-spilling skip loading



Main hoist room at New Orient mine. The two 2,000-hp. motors turning the 11- to 17-ft. stepped drum use Ilgner-Ward Leonard control.



This 9-ft. cylindrical-drum hoist at Valier is driven by a 1,350-hp. motor with filtered-air cooling system and Ilgner-Ward Leonard control.

gates, at Valier mine, Valier Coal Co. Before entering the dump, cars are weighed on Streeter-Amet scales with automatic weight indicator and recorder. Spotting the three different sizes of cars on the dump was solved by a home-made magnetic control operated by pushbuttons. Two small sprinklers keep down dust. Originally air-operated, the dump was electrified in 1929 with a 10-hp. two-speed induction motor. The hopper holds 3½ to 4 carloads.

#### Hoist One Skip a Minute

Skip weight at Valier mine is 11 tons and capacity is 16 tons. Four old cars or three new ones ordinarily fill a skip. Hoisting distance is 660 ft. Equipment consists of a 9-ft. straight-drum Ottumwa hoist driven by a 1,350-hp. General Electric motor with filtered-air cooling and Ilgner-Ward Leonard control. About one skip a minute is the usual operating rate, although a faster cycle of 8 to 10 seconds for loading and 35 to 45 seconds for hoisting is possible.

A two-car rotary dump and Link-Belt automatic skip-loading equipment serve the skip at Zeigler No. 1 Mine, Bell &

Zoller Coal & Mining Co., where the record has been 2,003 cars (7,486 tons) in seven hours.

Although not at present operated at that rate, the skip at New Orient mine, Chicago, Wifmington & Franklin Coal Co., designed by Allen & Garcia, has handled 13,563 tons in eight hours. Present production is 10,000 tons, requiring dumping 2,360 cars in seven hours. The Nordberg 11- to 17-ft. stepped-drum hoist is driven by two 2,000-hp. Westinghouse motors (semi-automatic flywheel control).

#### Dump Handles 410 Cars

A 2-car 1/2-over air-operated rotary dump has emptied as many as 410 cars in an hour, but the average is six per minute. The coal goes into separate weigh pans, one feeding each skip through air-operated safety gates. Each pan holds three cars of coal and is equipped with a Straight (Howe) scale and "Weightograph" which records, by progressive readings, the weight of each carload. A total of 25,500,000 tons has been handled by the installation. In 1939, 327,162 cars were dumped.

Mines using self-dumping cages (Table I) include Jefferson No. 20, Consolidated Coal Co., the deepest operating mine in the State, where hoisting distance is 800 ft. Cars are handled by a Litchfield 7- to 11-ft. stepped-drum unit driven by 28x48-in. steam engines. Capacity is three cars per minute. Manually operated Nolan cagers are being changed to air-operated automatic. New Monarch mine (same company), with a hoisting distance of 200 ft., employs a 6-ft. straight-drum hoist driven by 24x 36 engines handling 8-ton cages accommodating cars averaging 2.70 tons of coal. Cagers are Nolan. Average hoist output is 195 cars per hour.

#### Hoist Raises 1,600 Cars

Zeigler No. 2 mine, however, operates one of the highest-capacity cage hoists in the district and perhaps the country. With a hoisting distance of 345 ft., a 10-ft. straight-drum hoist driven by 28x 42-in. engines raises 6,000 tons in seven hours in cars holding 3.75 to 4.5 tons. Average output is 220 cars per hour, with the maximum 1,600 cars in seven hours. Cages, built at the mine, are used six

#### Table I-Salient Data on Certain Southern Illinois Shaft Hoists

Mine	Shaft Lining	Hoisting Distance, Feet	Wt. of Skip or Cage Tons	Av. Weight Coal per Cage or Skip	Type of Hoist	Size Hoist Drum, Feet	Hoist Power	Average Hoists per Hour	Rope Diameter Inches
Black Arrow No. 18	Concrete to rock	585	7 — Cage	3.70	Steam	6 to 9	26x42-in. engines	180	13%
Energy No. 5		390	61/2 - Cage	2.85	Steam		*****	160	13/8
Freeman Spur		220	Cage		Steam	7 cyl.	18x36-in. engines		11/8
	( 60 ft. concrete to rock at								
Harco No. 47	top and 60 ft. conc. at	473	8 - Cage	3.25	Steam	9 to 11	28x42-in. engines	208	11/2
	bottom.	)							
Harrisburg No. 43	Concrete to rock - 55 ft.	327	Cage	2.65	Steam	6 to 9	26x42-in. engines		13/8
Jefferson No. 20	Concrete to rock — 80 ft.	800	Cage	2.70	Steam	7 to 11	28x48-in engines		. 11/2
Kathleen		320	11 — Skip	8.00	Electric		600-hp. motor	100	134
Majestic No. 14		460	Cage	2.50	Steam	6 to 9	24x36-in. engine		13/8 13/8
New Monarch	All timber	200	8 — Cage	2.70	Steam	6 cyl.	24x36-in. engine		13/8
New Orient	All concrete	640	9 — Skip	14.00	Electric	11 to 17	2-2.000-hp. moto		2
Old Ben No. 8	All timber	500	7½ — Cage	3.25	Electric	7 to 11	2,200-hp. motor	200	11/2
Old Ben No. 11	Concrete to rock — 28 ft.		7¾ — Cage	4.50	Electric	7.33 cyl.	1,150-hp. motor	125	13/8
Old Ben No. 14	Concrete to rock — 65 ft		$7\frac{1}{2}$ — Cage	4.25	Electric	6.5 to 11.5	1,100-hp. motor	165	11/2
Old Ben No. 15	Concrete to rock	484	7½ — Cage	4.20	Steam	7 to 11	24x42-in. engine		11/2
Orient No. 1		600	12 — Cage	4.40	Steam	7 to 11	28x48-in. engine		11/2
Royalton No. 7	Concrete to rock — 32 ft		9 — Cage	3.84	Steam	7 to 10		160	15%
						conical			
Valier	All concrete	650	11 — Skip	16.00	Electric	9 cyl.	1,350-hp. motor	70	17/8
Zeigler No. 1		460	71/2 - Skip	9.50	Steam	6 to 9	28x42-in. engine		11/2
Zeigler No. 2		345	111/2 — Cage	5.70	Steam	10 cvl.	28x42-in, engine	200	11/2

<sup>\*</sup>Ropes used on the majority of the hoists are 6x19 regular-lay installations. Users of Lang-lay ropes include the four Old Ben mines. Preformed rope is used at Harrisburg 43 mine, while at Black Arrow No. 18 the 1%-in. ropes are purchased with the maximum oversize tolerance.

months, rebuilt, used another six months and discarded. Total load on the 1½-in. 6x19 regular-lay ropes is 17.2 tons (cage

and loaded car).

Three of the Old Ben Coal Corporation cage hoists are electrified, including, at Old Ben No. 11, the first Ilgner-Ward Leonard-controlled hoist used at a coal mine, installed in 1912 under the direction of A. W. Spaht. The self-dumping cages weigh 7½ tons and 1.9-ton cars holding 4½ tons are raised 667 ft. by an Ottumwa 7-ft. 4-in. straight-drum hoist powered by a 1,150-hp. General Electric motor. Average output is 125 cars per hour.

Rope life varies from less than 300,000 tons for cage hoisting to well over a million for skip hoisting. Skip ropes apparently have a life of 3½ times that of cage ropes. At Zeigler No. 2, with its very fast hoist cycle, life has been increased by raising one sheave to keep the ropes from slapping together.

#### 20-Ton Locomotives Used

Main-line locomotives at mines studied by Coal Age range from 8 to 20 tons. Number required naturally varies with weight, size of car, mine production, and length and grade of haul. At Valier, producing 7,500 tons per shift with cars holding 33, 41, and 51 tons, two 20and two 15-ton Goodman, one 15-ton General Electric and one tandem (13ton Goodman) locomotives deliver 1,817 cars per shift, hauling from five partings 12 to 2 miles from the shaft. Roads normally are graded to 2½ against the loads, with 3 per cent the maximum. Average trip size is 25 cars (minimum, 14 to 16; maximum, 50 to 60). Double track is laid 3 mile east and 2 mile west of the bottom. The original 56-lb. rail from shaft to partings is being replaced with 90-lb., of which 7,000 ft. is in place.

At New Orient, 20-, 15-, and 13-, 13-with 15-ton equipment and 10-ton General Electric and Jeffrey locomotives haul 4.7-ton-capacity cars to the bottom. They



Hitch-drill method of supporting crossbars using a short stringer on two pins, Old Ben mines.

serve eight sections, one 1½ and the rest 2 to 3½ miles from the shaft. The grade normally is kept to 2 per cent or less, which permits trips of 34 to 36 cars with the 20-ton, 25 with the 15-ton, 20 with the 13-ton and 18 with the 10-ton locomotives, which deliver 2,300 cars. Rail weight is being increased from 70 to 85 lb. Joints now are Thermit-welded (3,500 ft. to date).

Averaging 4,200 tons per shift, Old Ben No. 8 uses 3.25-ton wood cars hauled by three 13-ton Westinghouse, one 13-ton Goodman and four 8-ton Jeffrey locomotives. They pull 2½ to 3 miles from five partings against a maximum grade of 1½ per cent. The 8-ton locomotives haul 16 to 17 cars per trip and the larger 20 to 25 cars, delivering 1,200 cars. Track is laid with 40- and 60-lb. rail and the Main South is double-tracked for 1½ miles.

Main-line trips at Bell & Zoller mines are handled by 10- to 15-ton trolley locomotives on 60-lb. rail. Zeigler No. 1 employs six Goodman locomotives (five 15-ton and one 13-ton) in main-line work. Six 13-ton Jeffrey locomotives and one

10-ton Goodman machine operate on the main line at Zeigler No. 2.

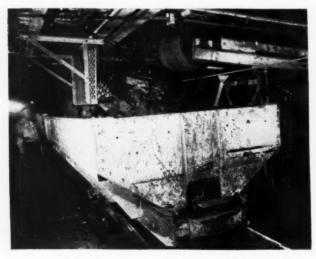
One 13-ton and two 10-ton General Electric locomotives haul from panel entry to bottom at Freeman Spur mine, Seymour Coal Mining Co., one of the few not employing relay locomotives. The three sections served are 1 to 1½ miles from the bottom. Trip size is 25 cars. Rail size is 60 lb. Maximum grade is 2.3 per cent, with the standard 2 or less.

Cars covered in the Coal Age survey ranged from 2-ton wood to 11-ton all-steel units. With more mechanical mining, most companies have been installing larger cars and changing from wood to plain or special steel. Many newer trucks are equipped with cast-steel wheels, although one mine is returning to cast iron. Most mines have installed anti-friction bearings. Operations purchasing new cars include Freeman Spur, where 75 new Watt 2.4-ton steel cars equipped with double-disk cast-iron Timken-bearing wheels supplement 150 2-ton wood cars with Hyatt-bearing wheels.

#### New Cars Made of Steel

Three sizes of solid-end cars are used at Valier. The oldest are 3\(^3\)-ton wood units with steel Z-bars in the corners; later 4\(^2\)-ton wood cars have steel bottoms. New cars (Mount Vernon and Watt all-steel units with 18-in. cast-iron wheels) hold 5\(^3\)-tons. Wheel installations in the last five years have been the plate type. Bearings are sealed and unsealed New Departure, Fafnir, and Timken. "Corten" bottoms are specified for new cars.

New Orient uses solid all-steel Timken-bearing 4.7-ton cars with Allen & Garcia semi-automatic couplers. Caststeel 16-in. wheels were installed four years ago. All new cars include copperbearing steel. Orient No. 1 employs steel end-dump cars (Watt and American Car & Foundry Co.). They weigh 2 tons, hold 4.7 tons and are equipped with 18-in. double-plate cast iron, Timken- and Tyson-bearing wheels, Miner draft gear and link-and-pin couplers.



Mother belt filling an II-ton all-steel car, Buckhorn mine.



Electric switchthrower at main junction in Buckhorn mine.







Typical southern Illinois main-line locomotives. Left, new Kathleen 15-tonner; center, new 20-tonner at New Orient; right, 13-tonner at Old Ben No. 14.

They are  $9x5\frac{1}{2}$  ft. wide and  $55\frac{3}{4}$  in. high. Additional cars with copper-bearing bodies are on order. Also, wood cars holding 3.9 tons with 1 ft. side boards are used.

At Old Ben No. 8 mine, 460 end-dump oak cars holding 3.25 tons are equipped with Monarch couplings. Replacement bodies are treated pine with oak top boards. The pine cars (44 to date) are reported to be tighter. Cast-steel wheels are being installed (325 cars) and bearings changed from solid-roller to Timken (378 cars). Cars at other Old Ben mines also are being equipped with cast-steel Timken-bearing wheels, first used over ten years ago. With 1,706 cars in use, 10,136 Timken bearings and 6,272 cast-steel wheels are installed. The original cast-steel wheels still are in service.

Kathleen operates 525 3\(\frac{3}{4}\)-ton solid-end wood and 90 4\(\frac{3}{4}\)-ton A.C.F. steel cars. Bethlehem forged-steel Timken-bearing wheels are being installed, the first going in two years ago. The 525 wood endgate cars at Majestic No. 14 mine, Pealody Coal Co., are equipped with a

hook-type coupler (p. 156), developed and patented by one of the staff. Some 25 per cent of the 15-in, wheels are cast steel.

At Buckhorn mine, twelve Sanford-Day four-door "1-2-3-4" drop-bottom cars handle the entire output. Each car holds 11 tons and trips of four with one locomotive serve the two mine sections. The cars are steel, 21x7 ft. The 41-ft. height may be increased about 10 in. They run on 60- and 75-lb. 42-in.-gage welded rail. Four wheels on two through axles are equipped with Timken bearings. The weight of the car rests on two double coiled springs at each wheel. Inner and outer springs have different periods, which design dampens oscillation and reduces rocking in transit. Spring draft gear and link-and-pin couplings are installed.

#### Car Replacements Progress

Replacement of original mine-car equipment with larger improved units has progressed steadily at Bell & Zoller mines since 1930. Early cars were of wood and had capacities of 3.3+ to 3.7+

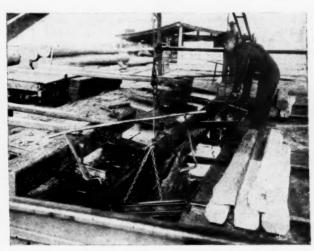
tons. All new steel cars are built with copper-bearing plates and spring draft gear. Cast-steel wheels with Timken bearings are specified on 100 new 4-ton cars.

As most southern Illinois mines operate several haulage locomotives, signal systems and dispatchers generally are employed. Normally, signals are manually operated, using pull switches, such as the M-S-A switches at Kathleen, also using an automatic trip counter (p. 162) and one of several operations employing electric switchthrowers (Cheatham) important main-line switches. Another Valier with Miller switchthrowers. Where locomotives at Zeigler No. 1 use a common track, interference is prevented by Miller manually operated block signals, with Miller electric throwers at principal junctions and switching points.

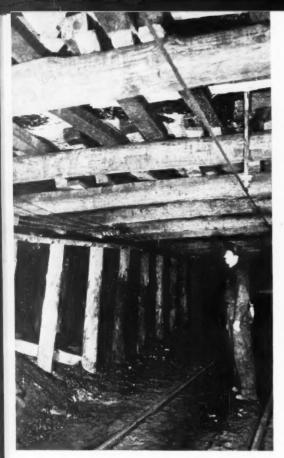
At all turnouts facing the trips on main lines and cross entries, red and green, and sometimes yellow, lights indicate the position of switch points in New Orient mine. An extension of the bridle bar operates through cams in a switch box to make and break the circuit to the



Laying new main-line track on treated ties at Royalton No. 7.



Treating ties and timber by dipping method at Kathleen mine.



Main-line timbering at the Bell & Zoller mines characterized by the use of treated ties, posts, collars, and cribbing.

lights. When green is lighted, the switch is lined for a straight track. A red light indicates that the points are cocked, or partly opened, or that the switch is lined for the curve. If the curve is the regular routing for a trip, the yellow light is illuminated.

Harrisburg No. 43 mine uses a home-made automatic signal system to show the main-line motorman his trip condition. A red light near the bottom flashes on and off as each set of car wheels passes over a rail switch. Thus the motorman can count the cars in his trip, as the switch is more than a trip length from the signal light.

#### Signals Show Obstructions

Automatic signals also are used at New Orient to show whether the road over a hill is clear of loose cars, standing trips, metal crossbars, etc., and also if a rail is broken. In this system, developed at the mine, short-circuiting of 2-12-24-volt current in an insulated rail section is used to actuate relays and thus change signal lights from one color to another (Coal Age, January, 1940, p. 35). Sections of 1,000 to 1,500 ft. have been operated satisfactorily. This system is very sensitive and has eliminated wrecks in swags and collisions at mainline and cross-entry junctions. Maintenance cost is low and use of this device to hold main-line trips at safe distances apart is being considered.

First welding of mine rails was done at New Monarch in 1933 and now several southern Illinois operations use this joint-making procedure. Initial work at New Monarch (Coal Age, July, 1936, p. 275) was on a 6,000 ft. section of 40-lb.

track where conditions afforded a severe test. Welding is based on veeing the joint opening, leaving the splice bars on the rail and welding them fast. The vee is filled during this process but sufficient room is allowed for a surface of well-peened manganese. Tests show that the resistance of a section of rail including a welded joint is almost exactly that of an equivalent length of the same size rail. Cost of welding a joint, including labor and material, but not power, is \$0.682. The same method is used at Buckhorn (100 per cent) and Jefferson No. 20.

#### Welded Track Cheaper

About 3,500 ft. of track has been Thermit-welded at New Orient mine to date. As compared to joints with angle bars and copper-weld bonds, material cost is practically the same, while installation labor is slightly more. Comparative cost data indicate, however, that over the ioint life Thermit-welding is cheaper. The welded joint requires no maintenance and has the electrical-conductivity characteristics of a continuous rail. Smooth track also means less wear on rolling stock and rails and no loss of traction at joints. Other Thermit users are Valier and Bankston Creek No. 5. Bankston Creek Collieries Co., an affiliate of the Sahara Coal Co. The 60and 70-lb. rail at Bankston Creek No. 5 is 100 per cent Thermit-welded.

Main-line rail weights at southern Illinois mines generally range from 60 to 90 lb. Two mines use some 40-lb. rail, being changed to 60-, and another is replacing 56- with 90-lb. rail. Main-line frog sizes usually are No. 3, 3½ or 4. No. 5 frogs, however, are most common at Valier. At Orient No. 1, because all new main-line curves are laid on a 280-ft. radius, a No. 6 Bethlehem or Pettibone-Mulliken manganese-steel flange-bearing frog is used. Harrisburg No. 43, Peabody Coal Co., has found that standardizing with Bethlehem cast manganesesteel frogs has reduced derailments practically 100 per cent. At Orient No. 1 and New Orient, among others, all mainline frogs, when worn, are built up in place with a high-carbon rod and resistance welders. One man can build up four No. 32 frogs in seven hours, using an average of 10 lb. of rod per frog. Worn crossovers are built up the same

Nearly all mines in the Coal Age survey use or plan to use treated ties. Zinc chloride and creosote are favored, with Osmose for a scheduled installation at Freemen Spur. Franklin County Coal Corporation began installation of zincchloride-treated ties (2 lb. per cubic foot) at Energy No. 5 and Royalton No. 7 mines in 1925. Experience has shown an average main-line life of six years, compared to one year for untreated ties. Comparative costs, including material and labor, show a saving of \$5.01 per tie (Coal Age, June, 1935, p. 245). Gum ties 5x6 in. x 5½ ft. are preferred. With "dry" mines, zinc chloride is found advantageous because of lower cost, greater resistance to fire and reduced likelihood of either real or imaginary injuries.

#### Treated Ties Last Longer

Treated ties date back to 1920 at Zeigler No. 2 mine, when a batch was installed on the bottom. Extensive use started in 1930. Treating specifications are ½ lb. of dry zinc chloride per cubic foot. Following trouble with pine and gum, oak was standardized on in 1931 and none have been replaced because of decay, compared to an untreated tie life of, at best, four years.

Orient No. 1 uses 6x8-in. ties with both zinc-chloride and creosote treatment but avoids creosote when possible because of the odor. Creosoted ties were installed in New Orient from 1922 until 1934. To obviate the possibility of burns and skin infection, zinc chloride was adopted in 1934. Less than 5 per cent of the creosoted ties have been replaced because of decay and none of the zinc-chloride ties to date.

Both zinc chloride and creosote (8 lb. per cubic foot) are used at Valier, most of the latter having been installed within the past twelve years. Untreated wood ties usually last two to three years, but with two or three steel ties per rail, life can be increased to four to six years.

Kathleen treats ties and timber at the mine. Two men dip 140 to 150 oak ties per day in a creosote bath kept at 210 deg. F. by steam pipes. Each tie is soaked 30 minutes. Penetration naturally is not as much as with pressure treatment, but soaked ties give twice the life. The same bath also is used to treat bars, legs, timber, cribbing, etc., and for the past two years everything but room props has been dipped.

#### Table II—Salient Data on Certain Southern Illinois Slope Mines

	Slope Lining	Slope Length, Feet	Belt Length, Feet	Average Cover, Feet	Slope Pitch, Deg.	Slope Size, Feet	Belt Width, Inches	Belt Construction	Motor Hp.
Bankston Creek No. 4.	None	313	390*	75	15	7x16	26	6-ply 42-oz. duck	30*
Bankston Creek No. 5.	All concrete with steps in floor slab		765	150	161/2	7½x15	54	9-ply 48-oz. duck	300
Blue Bird No. 6	Sides and top concrete for 125 ft.		530†	125	16	7x14	30	6-ply 42-oz. duck	40 and 75†
Buckhorn	All concrete for 217 ft.; concrete floor and brick center wall re-		900	190	1716	7x151/3	36	6-ply 42 oz. duc	

<sup>\*</sup> Figure given is hoisting distance. † Slope equipped with two conveyors in tandem; figure given under belt length is hoisting distance. † Dual-motor drive.



A 15-ton locomotive on 100-per-cent welded main-line track on treated ties in the New Monarch mine.



Part of the 100-per-cent welded 60- and 70-lb. track on treated ties at Bankston Creek No. 5 mine.

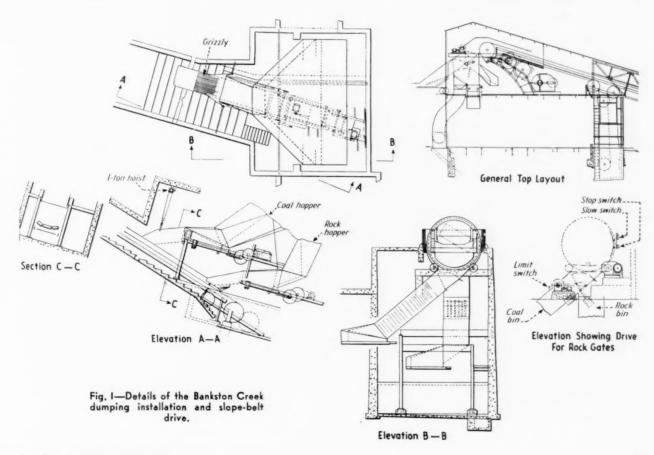
Several other properties use creosoted ties, including New Monarch mine, where they were installed in 1933 and have a life twice that of untreated ties. At Harco No. 47, Peabody Coal Co., where untreated ties lasted ten months, 5x7-in. x 6-ft. creosoted ties were installed five years ago and still are in service. All main-line ties at Old Ben mines are white oak treated with 6 lb. of creosote per cubic foot; likewise cribbing and timber on the main haul.

Untreated main-line timber is the rule at most properties but treatment is gaining ground. Starting in 1928 at Zeigler No. 2 mine (1930 at No. 1), zinc-chlor-

ide timber has been installed on all main lines, in all aircourses and in all panel entries to the point where the main panel seals are to be installed. Treated lagging, whether special or regular track ties, is used with all treated-timber installations. When roof breaks are encountered it is customary to clean them out to the solid and retimber to the top.

Main-line roof is supported at most mines by 8- to 12-in. I beams or rails on legs or in hitches in the ribs. Usually, support is not necessary because the No. 5 seam has a good shale roof and top coal is left in No. 6 seam mines. When required at New Orient, steel and wood crossbars or guniting is used. Usually, when height is available, treated timbers are installed on treated legs. Guniting has been resorted to in several cases where heavy cuts have been made in bad roof and also in one particularly heavy cut in the bottom. Gunite prevents continuous sloughing from exposure to air. The first was done on the main shaft bottom in 1922. Later it was extended to haulage roads. None of the latter jobs, all done by the mine staff, have needed subsequent attention.

At Old Ben mines, steel crossbars (Bethlehem CB sections, 23 lb. per foot) rest on supports made by hitch drilling



or on concrete-block walls. A homemade 10-in.-diameter drilling unit, incorporating a Dooley 473 slow-speed coal drill, makes hitches. On an average, 30 to 35 holes are drilled per shift. Two hitches about 2 ft. apart are drilled in each rib, and pins, car axles or rail 22 to 5 ft. long, are wedged in the holes. A stringer, 60- to 80-lb. rail 2½ to 3 ft. long, is placed across the pins and the crossbar rests upon the stringer (see accompanying illustration). Concrete blocks, frequently used, especially where there is doubt of hitch-drilling support, are three-cavity 8x8x16-in. units costing 16c. each. Where there is considerable weight, cavities are filled with concrete as the blocks are laid.

Valier uses a Goodman hitch drill and rail crossbars for main-line roof support. Where the rib is soft and the hitches will not support a crossbar, timber legs are employed.

#### Bars Supported on Pins

Some hitch-drill timbering has been done at Bankston Creek No. 5 with a regular coal drill. Pins, made from rail and set on 5-ft. centers, support rail stringers which in turn support the crossbars of rail or I-beams. Several holes are drilled in a group until the combination is large enough to take the pins, which are concreted in place. Mainline roof support, when required at Orient No. 1, is being standardized on 10-in. I-beam crossbars on 15-in. stringers on concrete piers 20 ft. apart.

Main-line grading, standardized at from 1½ to 3 per cent, is done at all properties. Cuts and fills usually run from 3 to 15 ft., one of the largest being a 33-ft. fill at Kathleen.

Track in working sections in southern Illinois mechanical mines usually is 30 lb. or heavier, with a number of mines on a 35- and 40-lb. basis. Height is not vital in most operations. Quite a few, therefore, use wood ties in rooms primarily for a more stable track, particularly on hills. However, convenience and quick installation and recovery have resulted in the adoption of steel ties by a number of mines, while most of those employing wood use steel under extension rails at the face.

#### Treated Ties Used in Rooms

Energy No. 5 and Royalton No. 7 mines are among the wood-tie users Rail weight is 30 lb. at Energy and 40 lb. on panel entries and 30 lb. in rooms at Royalton. Both mines use zinc-chloride-treated wood ties in both panel entries and rooms, supplemented by a few steel ties. Treated ties were adopted for this service in 1926. Present installations are 4x4 in. x 5½ ft. long. Normally, such ties can be used an average of four times by turning them over and sliding them back and forth. The maximum is six. Creosote-dipped wood ties are installed under the 40-lb. rail on panel entries in Kathleen mine. These ties are used an average of three to four times. Rooms are laid with 25-lb. rail on West Virginia and Bethlehem steel ties.

Panel entries at the Zeigler mines are laid with 35-lb. rail on 4x6-in.x5½-ft. white oak ties, extended into the rooms to the last changing switch (p. 80). Beyond, 35- and 25-lb. rail on West Virginia steel ties is installed. No. 3½ turnouts are used with 35-lb. entry track; No. 2½ in rooms.

Users of wood on panel entries and steel ties in rooms include Freeman Spur. Orient mines, Valier, etc. At Old Ben, however, room switches are laid on wood with West Virginia steel ties under other room track. One user of steel on panel entries is Harrisburg 43, where rail

weight is 30 lb. and Bethlehem ties are installed.

All new operations in southern Illinois—within the past three years—have been opened by belt slopes. All these slopes were driven by loading machines, which idea was originated by the Consolidated Coal Co. for opening its Buckhorn mine in 1937. Cover depth at the slope location is 195 ft., of which approximately 65 ft. is surface material. Draglines and tractor-powered wheeled scrapers removed clay, shale or other loose material for 217 ft. of the total slope length of 633 ft. In rock, the slope was

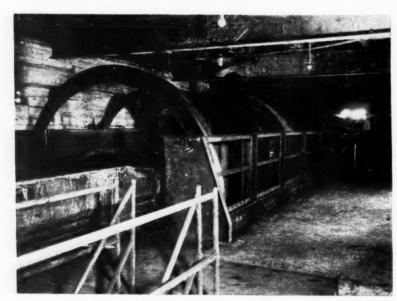


"Almost an inch thick." The heaviest belt ever made (765 ft. long, 1,000 tons per hour) being inspected in the Bankston Creek No. 5 mine.

driven 7 ft. high and 15 ft. 4 in. wide. Inclination is 17½ deg.

Driving in rock was done with a Joy 8 BU loading machine spoiling into, first, chain-conveyor equipment, supplemented, when the slope neared the bottom, by a temporary belt. Working three shifts, five-man crews, including bosses, averaged 22 ft. a day. Near the No. 6 seam, a branch was curved into the coal, while the main part was extended down into the No. 5 seam some 50 ft. below. Between the two seams a raise was driven up to the center of the dump-hopper site. The hole then was uncovered by driving around from the slope branch and chain conveyors were set up to develop the bottom, the conveyors discharging through the raise.

Excavation for the 90-ton dump hopper for No. 6 coal consisted of shooting out around the raise. Coal is fed out of the hopper, designed for bottom-dump cars, by a 15-hp. Link-Belt reciprocating feeder onto a Joy slope conveyor 900 ft. long between pulley centers and equipped with a 36-in. 6-ply 42-oz.-duck Goodyear belt. Conveyor capacity is 300 tons per hour at 375 f.p.m. It is operated through a Link-Belt dual drive (rubber-lagged



A two-car 360-deg, rotary dump empties cars in Bankston Creek No. 5 mine. The 171-cu.ft. cars, with high-tensile-strength corrosion-resisting steel bodies, are equipped with anti-friction bearings and semi-automatic couplers.



Looking along a 30-in. main-line belt conveyor in Blue Bird No. 6 mine.

pulleys) by two 2,300-volt Westinghouse motors (100 and 40 hp.). The slope is concrete-lined for 217 ft. with a center wall between belt and man-and-materials compartment equipped with a track and 50-hp. hoist. Beyond the lined portion, the floor slab and center wall (14-in.thick brick with 4-ft. openings on 20-ft. centers) is continued to the bottom of the slope.

A 5BU loading machine was used in sinking the Bankston Creek No. 5 slope mine in the fall of 1937. The second to use this method, Bankston Creek found the cost, in rock, to be about one-third a contractor's fee. In addition, the slope, 15 ft. wide,  $7\frac{1}{2}$  ft. high and 606 ft. long on a pitch of  $16\frac{1}{2}$  deg., was driven in 120 seven-hour shifts (Coal Age, September, 1939).

## Sinking Rate 51/4 Ft. per Shift

Rate of driving was 51 ft. per shift. Subsoil was removed with a dragline. Through the rock the 5BU loaded onto a 15-in. Joy chain conveyor which emptied onto a 26-in. Joy belt conveyor (Goodyear belt). This conveyor deposited the rock in a truck. A sinking crew comprised, with boss, six men. The slope is lined its entire length, which required 1,123 cu.yd. of concrete reinforced with steel rods and old mine rails. The concrete floor and steps were poured first the entire length of slope. and top were concreted from the bottom up using 20-ft. forms removed and reused in succeeding sections. Concrete was mixed on the surface and dumped into a wood chute. Close control of mix water permitted the concrete to reach the forms without segregation.

Facilities on the slope bottom include a two-car rotary dump and coal and rock hoppers and auxiliary equipment in a concrete pit. Excavation was done by mine labor, using an 8BU loading machine and the conveyors already in the slope. Plans and equipment were furnished by the McNally-Pittsburg Mfg. Corporation. Concrete totaled 937 cu.yd. and pouring and structural work required six months (two shifts form building and one shift pouring). Installation of equipment took an additional three months. Concrete was delivered through a borehole lined with 6-in. pipe.

Cars are spotted in the dump by a car haul driven by a General Electric Type MR 40-hp. totally inclosed fancooled motor through a Falk speed reducer. A 40/20-hp. Type KF motor and a Falk reducer operate the dump. Beneath is a 50-ton coal hopper supplemented by a 50-ton rock bin to permit dumping and storing an occasional car of rock during the working shift. Gates operated by a 3-hp. motor through a worm reducer divert rock.

Reciprocating feeders move coal and rock onto the main belt. The coal feeder is driven 48 strokes per minute maximum by a 15-hp. motor through a Reeves variable-speed transmission. The rock feeder (40 strokes per minute) is driven by a 10-hp. motor.

#### 54-in. Belt on Slope

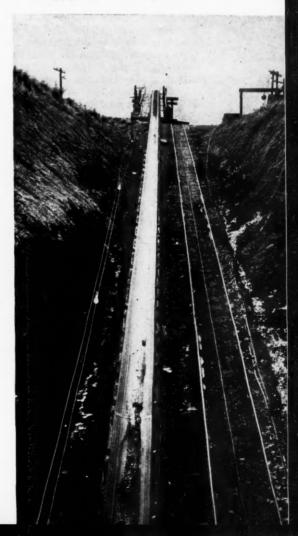
The Bankston Creek No. 5 slope is equipped with the heaviest belt ever made—a 54-in.-wide 9-ply 48-oz.-duck United States Rubber Co. unit on a McNally-Pittsburg conveyor. The 48-oz. duck was used to keep down the number of plies. The belt extends 765 ft. up the slope to a 54-in. transfer belt which carries the coal to the washery. A chute is arranged so that when rock is hoisted it can be fed into the truck bin. The chute gate is operated by 3-hp. motor and Foote Bros. worm reducer. The slope belt is driven immediately behind the head pulley by two 60x57-in. pulleys in turn driven through a Falk speed reducer by a General Electric 300-hp. 900r.p.m. wound-rotor motor.

Well satisfied with the method of slope driving developed at No. 5, Bankston Creek opened No. 4 mine in July, 1939, driving the 7x16-ft. slope 313 ft. long on a 15-deg. pitch in like manner. Sinking procedure was the same as at No. 5 mine. At this slope, track was laid on one side as sinking progressed, thus facilitating handling supplies. Six-man crews, including bosses, did all the sinking and timbering. Average progress was 6 ft. per shift. The slope is unlined and is equipped with a 26-in. belt conveyor in addition to the track.

## Slope Driven in 30 Days

The 15-deg. 7x14-ft. slope 382 ft. long serving the new Blue Bird No. 6 mine, Blue Bird Coal Co., was driven in 1939 in 30 days (three shifts per day) by fivemen crews, including bosses. A dragline spent six shifts removing subsoil to 0+72 ft. and 30 days was required for driving 310 ft. in rock, using an 8BU Joy loading into 12-ton pit cars. The top of the slope is concreted 125 ft. down, except on the floor. Two conveyors are installed in tandem, one a 36-in. Stephens-Adamson unit with 30-in. Goodyear belt and the other a 30-in. Barber-Greene unit. The top conveyor, 290 ft. long, is driven by a 40-hp. motor drawing 23 hp., and the bottom one, 320 ft. long, by a 15-hp. motor drawing 16 hp. Underground transportation at Blue Bird is handled by 600-ft. Barber-Greene conveyors in series.

Surface end of the 15-deg. slope at Bankston Creek No. 4 mine. The 26-in. slope belt is on the left and the manand-supply track on the right.



# VENTILATION AND PUMPING

# Southern Illinois Deep Mines

GENERALLY uniform conditions, including fairly level seams, thick coal in most cases and cover seldom breaking to the surface, have brought about ventilation and drainage patterns varying but little throughout the 23 mechanical mines in southern Illinois included in the Coal Age survey. The majority recover the No. 6 seam, usually over 8 ft. thick, of which 7 ft. or more normally is mined. The remaining properties, all in Saline County, mine the No. 5 seam, running down to 4½ ft. in some areas. Output from fully developed mines ranges from 1,000 tons in 4-ft. 10-in. coal to 10,000 tons in 8-ft. coal (New Orient mine, Chicago, Wilmington & Franklin Coal Co.). The average operation ships 3,000 to 5,000 tons a day.

With three belt-slope exceptions, mines surveyed are served by shafts averaging 413 ft. deep. Deepest (740 ft.) is Jefferson No. 20, Consolidated Coal Co. Shallowest is Consolidated's New Monarch, 160 ft.

Outlying airshafts to reduce air travel are installed at the three mines. One of these, at No. 8, Old Ben Coal Corporation, dates back to 1918. It is 425 ft. deep and one mile from the plant. Kathleen mine, Union Collieries Co., 100 to 320 ft. of cover, also is equipped with an airshaft one mile from the plant. At New Orient, opened in 1923, a new airshaft was sunk in 1931, 23 miles north of the main and auxiliary shafts, which are close to the south boundary. Active

mining has progressed one-half to threequarters of a mile north of the new airshaft.

Fans have been placed underground near the bottom of the airshaft in two instances. One installation three years ago at Old Ben No. 11 replaced an old top shaft centrifugal fan driven by a 300-hp. motor. The new fan, a Jeffrey 6-ft. Aerodyne, is driven by a 75-hp. motor with starting equipment at the top of the 615-ft. shaft. As is usual with new underground fan installations, the old fan and drive serve as a spare unit.

Reflecting design progress, two fan replacements have been made at Kathleen in the last seven years. Now, 39 per cent more air now is being delivered with 10 per cent less power (Table II). The latest installation, made a year ago, consists of two Jeffrey 6-ft. Aerodyne fans near the auxiliary-shaft bottom each on a main split. Each is driven by a 220volt Type CS Westinghouse motor with Gates V-belts. The south-split fan (75hp. motor) delivers 85,900 c.f.m. at a 4.55-in. w.g. The north (40-hp. motor) delivers 78,000 against a 2.67-in. w.g. A vane and mercury switch on the wire guard on each fan signals running condition. The original centrifugal fan, maintained as a spare, has two drives, a steam engine and a 150-hp. motor.

Two mines have new streamlined fans at the shaft tops. The largest, a 9-ft. 3-in.-wheel 800-r.p.m. Jeffrey Aerodyne, is at the new airshaft at New

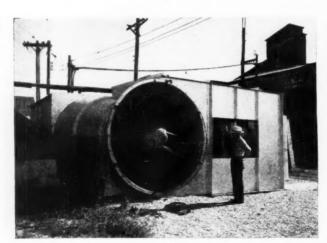
Orient. The power requirement is 87 kw. against 275 kw. with the old fan before the new airshaft was sunk. The Peabody Coal Co. in 1937 installed a 6-ft. Aerodyne fan at Majestic No. 14 alongside a steam-driven centrifugal left in place as a spare. The drive is a General Electric Type KT two-speed motor, 440 volts, 150 hp.

Seven years ago, Old Ben replaced the 1918 5x16-ft. centrifugal fan at No. 8 mine, with a 5x8-ft. Robinson backward-curve unit with Timken bearings and 150-hp. 2,300-volt slip-ring induction motor. A Jeffrey 7-ft. Aerovane fan was installed at Jefferson No. 20 in 1938 in place of a steam-driven centrifugal left in place for standby duty. A Robinson backward-curve 6x102-ft. fan at Valier mine, Valier Coal Co., is provided with a 75-hp. auxiliary motor for use if the 250-hp. regular motor should fail and also to operate the fan at reduced speed during a prolonged shutdown. V-belts and a second pulley make the change.

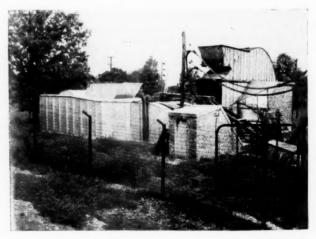
Pending further development, Bankston Creek No. 5, Bankston Creek Collieries Co., an affiliate of the Sahara Coal Co., is being ventilated temporarily with a Sirocco fan at the auxiliary slope. A return-air stack 35 ft. high at the belt-slope mouth is installed to reduce air passing up the steel gallery housing the belt and thus minimize condensation dur-

ing cold weather.

A booster fan (straight-flow type) is used on one split in Valier mine. It is



The Majestic No. 14 steam fan was relegated to spare service by this new 6-ft, unit.



1918 original and 1932 replacement fans at the outlying airshaft, Old Ben No. 8 mine.

provided with an automatic bypass door which opens if the fan should stop. An airvane switch, in case of stoppage, illuminates a sign reading "Fan Stopped" on the main haulage 14 miles from the bottom. Motormen are instructed to notify the dispatcher or mine manager immediately if the sign is lighted.

Two to eight splits serve the mines surveyed by Coal Age. Three, four or five splits is the usual number. Overcasts in use generally number five, six or seven, with the minimum three and the maximum thirteen. New Orient leads with eight splits, and Valier with thirteen overcasts. Kathleen mine employs six overcasts and one undercast. Only two or three southern Illinois mines have doors (all non-automatic) on the haulage. On the sections, it is customary to use four doors per unit. Thus, many mines have sixteen or more doors in use.

With thick coal, in the majority of cases, resulting in a large heading area. and with shafts usually near the property centers, thus tending to reduce haulage distance, most large southern Illinois mines drive four-heading mains. One of the several companies to increase heading number in recent years is Old Ben, which raised from two to four headings to reduce water gage. Five-heading mains are scheduled for future work at New Orient. Harco 47 mine, Peabody Coal Co., has raised the number from two to three. The Franklin County Coal Corporation, in addition to mains, also has raised panel headings from two to three and thus is one of the few so far to depart from the standard two-heading practice, the others largely falling in the new rubber-tired haulage or conveyor-transportation classification, where the tendency is toward

Table I—Ventilation Data for the Principal Shaft Mines of Southern Illinois.

Total Air, C.F.M.	Water Gage Inches
114.000	3.60
	3.65
	4.65
	2.00
- 164 000	3.60
190.840	3.80
178.892	2.80
	1.5
	1.95
	0.75
	0.50
	3.20
130,000	4.50
	4.00
	3.00
	4.35
	5.00
	3.80
100,000	3.80
	C.F.M. 114,000 110,000 146,000 129,000 164,000 190,840 178,892 135,000 111,000 120,220 60,000 185,000

Table II—Air and Power Data for the Original Fan and Replacement Installations at Kathleen Mine.

Jeffrey 5x12-ft. cen-	Total C.F.M.	Power, Kw.
trifugal, top of shaft Two Jeffrey 6-ft.	117,700	116
Aerovanes, bottom of shaft	125,198	91.1
Aerodynes, bottom of shaft	164,016	105.5



Seal deflector and protecting cribs on a cross entry in Black Arrow No. 18 mine.

The panel seal is 30 ft. in to the left.

a larger number of headings for any given entry.

Southern Illinois mines nearly all use the panel system (solid pillars all around rooms except at the panel entrance). Room pillars normally are left in place except for some slabbing or pocketing practiced where conditions permit. Sometimes a room may be omitted on either side of a panel, leaving a solid pillar for extra protection. As the only entrances to a panel are the headings, sealing, if done, requires only blocking these.

Regular practice in five large mines is to seal the panel entry as soon as the adjacent panel has been worked out. These seals are against gas only and so seldom are over 24 in, thick, The five are Zeigler Nos. 1 and 2, Bell & Zoller Coal & Mining Co.; Black Arrow No. 18 and Harco No. 47, Peabody Coal Co.; and Valier.

Zeigler panel seals are monolithic concrete (1-2-4 mix) not less than 18 in. thick. To hold the roof coal zinc-chloride-treated posts and headers are set on each side of the seal. Preparatory to pouring, ribs are hitched back to the solid and the bottom fireclay 1 to 2 ft. thick is trenched to the hard slate. The 3 to 4 in. of concrete next to the roof coal (a moist cement-and-sand mix) is tamped into place.

Panel seals in the Peabody mines are placed 30 ft. inby the cross entry and consist of two rows of concrete blocks 8 in. apart, The space and hollows in the blocks are filled with concrete. Two rock-filled cribs 4 to 6 ft. square on each side of the seal prevent caves. Brattices of Burkett lath or shiplap along one side of the outer cribs deflect air across the seal. At Black Arrow No. 18, 3 to 7 ft. of fireclay must be excavated to reach solid bottom. Several sealed sections near the bottom at No. 18 mine are bled to the surface through an 8-in. borehole. In Majestic No. 14, panels are sealed only

when they show signs of squeezing (fourteen to date).

Valier panel seals have been changed from monolithic concrete to double-row solid-concrete blocks 1 in, apart. With this construction seals can be built during operating shifts without haulage interference, Permanent cross-entry seals are poured concrete, 18 in. minimum thickness,

Panels in the Orient mines are sealed only when a bad roof condition occurs, but completed sections are closed off with solid concrete 2 to 3 ft. thick. All cross entries and, in a few instances, panel entries in Kathleen mine are sealed with 18 in. of concrete. Likewise, in the Old Ben mines, all cross entries serving areas 1,475x5,000 ft. are sealed when they become old works—after about nine years of mining. Those seals are concrete 4 ft. thick.

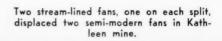
Permanent stoppings between chain pillars in practically all southern Illinois mines are built with one row of concrete blocks plastered on one or both sides. Tile is used regularly in Blue Bird No. 6, a shallow non-gaseous mine of the Blue Bird Coal Co., and also is employed to some extent in place of concrete blocks in Kathleen mine. Orient No. 2 permanent stoppings are solid concrete 1 ft. thick. Burkett lath, usually plastered on one side, constitutes most of the temporary stoppings. Some mines use shiplap and a few omit plastering.

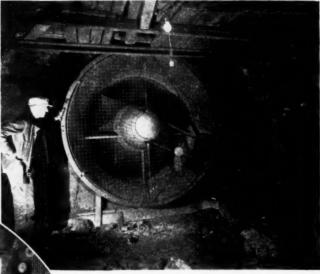
Although few mines in the district use auxiliary fans or blowers, underground equipment at Orient mines includes a number of 8-in. Sirocco units. Blue Bird No. 6 (rubber-tired haulage) has one Jeffrey centrifugal blower for miscellaneous use. In Jefferson No. 20, Aerodyne "Midget" and Ladel-Troller blowers without tubing are used between crosscuts.

A Joy 5BU loader and shuttle car were used to open an airway 250 ft.



This new airshaft and fan at New Orient reduced ventilation demand from 275 to 87 kw.





Two 150-hp. 1,755-r.p.m. motors, one drive and one spare, at the New Orient fan.



In reopening an airway in Jefferson No. 20, men worked the material down to the loading machine under the newly erected steel beams.

Loader in position ready for the shuttle car used in the airway clean-up in Jefferson No. 20. across caved entries to one side of the airshaft in Jefferson No. 20, formerly Nason, reopened in 1938 after a six-year shutdown. Steel forepoles and cross beams were erected as the clean-up progressed. Men with picks, under close supervision, pulled all material down for loading to prevent sudden slides of large proportions. The rock was loaded into a shuttle car which dumped it near by in several places driven especially for this purpose. Methods of timbering and working are illustrated on p. 106. Fifteen-inch I-beams on 5-ft. centers rest on 90-lb.

rails on treated posts.

Much of the water handled in Harrisburg No. 43 mine, Peabody Coal Co., contains acid to the extent that anti-corrosion pumps and piping are necessary. Two discharge lines up the main shaft are 6-in. Universal cast-iron pipe. One borehole is cased with a lead-lined steel pipe and another was lined by casting a 6-in, pipe in concrete in the center of a 14-in. casing. The largest of four pumps delivering to the outside is a Dayton-Dowd 1,000-g.p.m. Duraloy unit. The others are: Scranton 800-g.p.m. bronze. Weinman 400-g.p.m. chrome-iron and Aldrich 6x9-in. cement-lined triplex, porcelain plungers. The standard gathering pump is the Deming 6x10-in, simplex with 10-hp. 275-volt d.c. motors. Latest auti-corrosion piping is an 1,800-ft. stretch of 2½-in, "USS" Duroline concrete-lined steel pipe. Other anti-acid piping comprises 3,000 ft. of Universal cast-iron and 3,600 ft. of Wyckoff woodstave pipe.

Other shaft mines surveyed are classed as "dry." However, in addition to shaftbottom pumps, several have one to three borehole pumps. Three Old Ben Coal Corporation mines employ Deming and Goulds triplex pumps, principally 6x8in., at each of the shafts. Only No. 15 mine has a borehole pump (Goulds triplex 4x6-in., Westinghouse 30-hp. d.c. motor). All Old Ben mine pumps are fitted with float switches and are automatic in operation. Relay and gathering pumps are used in Mines No. 14 and 15,



This experimental stack reduces condensation in the belt gallery at Bankston Creek No. 5 mine.

two in the former and seven in the latter. Five months ago the 5- and 7½-hp. motors driving No. 15 pumps were equipped with new Ohio Brass automatic starters.

Water rings in the main and auxiliary shafts at New Orient mine are connected by an inverted siphon and water from both is pumped out the auxiliary shaft by a 62x12-in. vertical triplex pump driven by a 50-hp. 220-volt a.c. motor. One borehole is fitted with a Fairbanks-Morse 200-g.p.m. centrifugal pump. Two tank cars with small centrifugals are used for gathering. At Orient No 1, two Deming 6x8-in. triplex units (float-switch controlled) pump through the main shaft and a borehole. This mine also uses 50g.p.m. Fairmont and Deming "Oilrite" gathering pumps. Lines underground are principally 4-in. Universal cast-iron pipe. New Monarch mine is another with acid water. Consequently much of the underground is served by 4-in. Universal cast-iron pipe supplemented by some cement-lined pipe. Water is gathered by ten small reciprocating pumps, some drawing from as many as ten places. Locally made wooden shut-off valves operated by wooden floats control the multiple suctions. Three shaft pumps and three borehole pumps (200 to 1,400 g.p.m.) are installed. A new bronze pumping unit recently was installed in Jefferson No. 20 mine (740-ft. shaft). Both the two-stage 150-g.p.m. 800-ft.head pump and ARX 30-hp. 220-volt motor were made by Allis-Chalmers and operate at 3,550 r.p.m.

Kathleen mine is dewatered by eight Meyers 30-g.p.m. gathering pumps, one Goulds 50-g.p.m. relay and five 30- to 50-g.p.m. units delivering outside (three at the shafts and two at boreholes operating 10 hours out of 24). Zeigler No. 1 is dewatered through a borehole by one Cameron 220-g.p.m. 500-ft. head threestage centrifugal pump driven by a 50-hp. motor. Shaft leakage is handled by three small pumps. Zeigler No. 2 has

six small pumps, three discharging through the shafts. Main pumps in both mines are float-switch controlled.

General protection against flooding of Franklin County mines is provided by a 300-ft. barrier pillar against all operations to the south. The No. 6 seam mined in this area dips north and east from the outcrop in Williamson County, where mining originally started. In the old days, little or no attempt was made to maintain barrier pillars between operations, with the result that there was little resistance to the northward movement of water accumulated in the old and worked-out properties. This was the major factor in the loss of Old Ben No. 18 mine in 1935 and the partial flooding of certain other Williamson County properties. This flooding resulted in Franklin County operators adopting the plan of leaving a 300-ft. pillar south of their properties to prevent any possibility of impounded water breaking through.



New 150-g.p.m. 800-ft.-head bronze pump in Jefferson No. 20



1,000-g.p.m. pump of acid-resisting chrome alloy, Harrisburg No. 43.

# STRIPPING METHODS

# Southern Illinois Field

WITH overburden seldom averaging less than 40 ft. and normally containing plenty of rock, southern Illinois strip mines use shovels alone or with draglines to uncover 4 to 7 ft. of coal. As most shovels are fairly new, dipper replacements to increase capacity are in the minority, though some have been made on older units. Shooting overburden is universal, and conventional vertical and sidewall drills are supplemented by vertical augers or rotary drills. Liquid oxygen is widely used.

Average cut width at the eight southern Illinois strip mines surveyed by Coal Age varies from 40 to 60 ft., sometimes going up to 90 or 100 ft. in thin, easy-to-handle overburden. Utility and special equipment ranges from 1-yd. draglines up to 10-yd. machines and large tractor-powered scrapers for box-cutting, other development work and miscellaneous excavation.

Loading shovels range from 2 to 7 cu.yd., with an aluminum-alloy dipper on the latter. New and larger alloy-steel dippers also have been installed on several loaders. Most of the operations are equipped with washers, and at these pit cleaning normally consists of bull-dozing off the heavy stuff. The coal

usually is shot before loading and auger drills are coming into greater use. Transportation at most operations (p. 112) is based on tractors and semi-trailers.

The latest southern Illinois strip operation is Bankston Creek No. 6, Bankston Creek Collieries Co., an affiliate of the Sahara Coal Co. Recovering the No. 6 seam, averaging 41 ft. in thickness, Bankston Creek No. 6 uses a Bucyrus-Erie 950-B electric stripper with 108-ft. boom, 72-ft. dipper handle and 30-cu.yd. Man-ten dipper. On a normal schedule, this unit moves 650,000 cu.yd. per month. Coal is loaded with a Bucyrus-Erie 100-B electric shovel with 62-cu.yd. Manten dipper. Auxiliary equipment includes a Bucyrus-Erie 37-B shovel and dragline with 14-cu.yd. dipper, a Link-Belt K-40 dragline with 1-cu.yd. bucket both used for ditching, road building, etc .- two Caterpillar D-6 and one International T-40 tractor with LaPlant-Choate and Bucyrus-Erie bulldozers and one Caterpillar No. 12 road patrol.

Overburden thickness ranges from 20 to 65 ft., with the average 41 ft. Over the coal is 5 to 10 ft. of limestone, followed, as a rule, by 8 to 10 ft. of shale, 8 to 10 ft. of sandstone, shale and surface material. Usual cut width is 50 ft.

and an 18-ft. berm is left for haulage. Eight Bucyrus-Armstrong 29-T overburden drills put down 7½-in. holes on a 24-ft. spacing about as in Fig. 1. No change is made in spacing except on inside curves and the like.

Bankston Creek No. 6 operates its own oxygen plant for "Airmite" overburden shooting. Airmite cartridges 6½ in. in diameter and 22 in. long have a normal weight of 28 lb., of which about 22 lb. is oxygen at the time of firing. The usual charge is seven cartridges, or 196 lb., per hole, placed in the bottom. Oc-

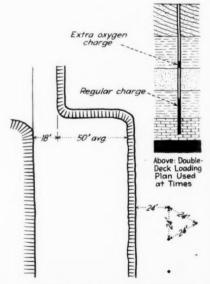


Fig. 1—Standard plan for drilling overburden holes at Bankston Creek No. 6. Inset shows double-decking of charge when desirable.

casionally, however, two extra cartridges are placed some 30 ft. up in the hole and close to the sandstone to assist in breaking the top of the bank. Overburden broken averages 4½ to 5 cu.yd. per pound of oxygen.

Preparatory to moving to a new field this fall, Delta mine, Delta Coal Mining Co., recovering 4 ft. to 4 ft. 2 in. of No. 5 coal, has acquired a Marion 5320 electric dragline (150-ft. boom and 10-cu.yd. Page bucket) to assist the present Marion 5321 shovel with 12½-cu.yd.



Stripping at Bankston Creek No. 6 is done by this new electric shovel with 30-cu.yd. alloy-steel dipper.



Shovel and dragline working in tandem in 70-ft. overburden, Burning Star mine.

alloy-steel dipper with manganese lip, increased from 10 yd. Now engaged in box-cutting for the new pit, the dragline will be used in tandem with the stripper (97½-ft. boom, 60-ft. dipper handle).

Delta utility units include a Marion dragline with 2½-yd. bucket, Caterpillar R-5 tractor with Baker bulldozer and Caterpillar No. 10 road patrol. Coal is drilled with a Cleveland pneumatic drill (Schramm compressor), shot with Alton pellet and loaded with a Marion 480 electric shovel with  $2\frac{1}{2}$ -cu.yd. dipper.

Overburden in the present pit ranges from 40 to 56 ft. thick, averaging 47. In the new pit, the range will be 20 to 50 ft. Over the coal is about 30 ft. of gray shale with about 1½ ft. of limestone on top in the new field. Average cut width is 60 ft. Under these conditions, shovel performance is about 400,000 cu.yd. per month.

## Vertical Auger Drills Bank

Overburden is drilled by sidewall and vertical auger units, all Delta make. The sidewall drill normally is used where banks are lower, with the vertical auger in high banks-particularly where hard spots occur high up. The Delta auger drill, evolved from a unit first installed in 1936, is built on a tractor chassis equipped with a 50-hp. electric motor instead of the usual engine. A mast fitted with guides carries the 25-hp. gearmotor driving the 6-in, auger. The gearmotor is raised and lowered for adding auger lengths, etc., by a 7½-hp. Sullivan hoist. Swinging racks on each side of the mast hold the 12-ft. auger sections and facilitate adding them on or taking them off. Auger diameter is 6 in., which obviates springing holes.

Diameter of sidewall augers is 5 in. The explosive is 4x26-in. Alton black powder with 30-per-cent gelatin core. Sidewall-hole spacing is 17 ft. in deep overburden, grading up to 22 ft. in shallow. With the vertical auger, 6-in. holes

(this size obviates springing) are drilled in rows 20 ft, apart, with holes 25 ft, apart in individual rows (Fig. 2). Although single holes can be drilled in approximately 45-ft, burden in 10 to 15 minutes, including moving, usual auger performance in this depth, with about 30 ft, of medium-hard shale, is sixteen or seventeen holes in seven hours. Vertical holes are loaded with 5x26-in. Alton black with gelatin core. The goal for all shooting is 5 cu.yd. per pound.

One of the several tandem operations in southern Illinois is the McLaren mine, McLaren Coal Co. The No. 5 coal ranging in thickness from 3 ft. 8 in. to 4 ft. 5 in. and averaging 4 ft. is recovered. One of the stripping units is a Bucyrus-Erie 225-B steamer with 85-ft. boom, 58-ft. dipper sticks and a 6-cu.yd. bucket equipped with a 320-B boiler, base, deckplates, etc. The second is a Monighan diesel-powered 6-W walking dragline with '135-ft. boom and 6½-cu.yd. Page automatic bucket originally used to strip pillars in an old No. 6 deep-mine section (Coal Age, March, 1939, p. 32).

Overburden on the No. 5 seam tract ranges upward to the stripping limit of 55 ft. and averages about 32 ft. Over the coal on about one-fourth the acreage is a black slate, followed by gray shale, cap rock, and clay and surface material. Hard material runs about 12 ft. as a general rule. It is drilled with a sidewall drill (4-in, holes) and is shot with "Blaxstrip" Alton 3x26-in. (3x16-in. gelatin in wet holes). Hole spacing varies from 20 ft. where the hard material runs up to 17 ft. to 25 ft. with 8 to 10 ft. of hard stuff.

The dragline usually takes off the soft stuff down to the rock or to half the depth of the overburden, leaving the hard material and any remaining soft to the shovel. In a normal month the shovel alone can handle about 135,000 cu.yd.; with the dragline the output is doubled. Usual cut width is 45 ft., and

an 18-ft. berm is carried as a roadway. The stripper is assisted by an R-5 tractor with LeTourneau bulldozer, which also cleans off the coal ahead of the loading shovel—a P & H Model 700 gasoline machine with 2-cu.yd. dipper. Hand cleaning supplements bulldozing. Before loading, the coal usually is shot with Alton gelatin or pellet (Hardsocg vertical-auger electric drill).

Overburden at the Pyramid Nos. 1 and 3 mines, Pyramid Coal Corporation, normally ranges from 30 to 50 ft. Average thickness of the No. 6 seam recovered is 6 ft. Over the coal is 0 to 5 ft. of slate (average, 3 ft.), an average of 12 ft. of hard limestone and clay and surface soil. The stripper at No. 1 is a 950-B electric shovel with 105-ft. boom, 72-ft. dipper handle and 30-cu.yd, Manten dipper. A 750-B machine with 95-ft. boom and 64-ft. dipper serves No. 3. Usual cut width is 45 ft. Utility equipment includes Caterpillar 40 tractors with Bucyrus-Erie bulldozers and a Bucyrus-Erie 375 dragline with 10-cu.yd. bucket for development work, including box cuts, inclines, ditching, etc.

#### Rotary Drill Is Faster

Overburden-drilling equipment at Pyramid No. 1 comprises two 29-T well drills, supplemented by a Sullivan "Stripborer" for ditches, inclines and other places inconvenient for the regular equipment. Pyramid No. 3 does all its drilling with two Sullivan rotary machines operating on the oil-well principle. Using Hughes rotary bits, these drills each averaged 6.14 holes per shift in April, 1940 (surface material, 20 ft. average; shale and limestone, 15 ft.).

Holes are 6 in. in diameter and are spaced 18 ft. in rows 21 ft. apart. The blasting medium is "L.O.X." and the company maintains an 80-liters-per-hour oxygen plant. Cartridges are about 2 ft. long and when fired contain about

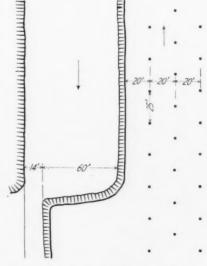


Fig. 2—Standard plan for vertical overburden holes at Delta mine, using verticalauger drill.

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Finishing up in one end of the McLaren pit, showing cleaning, drilling, loading and haulage operations.



One of the scrapers picking up its load in a box cut at Burning Star for disposal at the upper left.

12 to 14 lb. of oxygen. Holes are filled to the top of the hard strata. Coal is loaded by an 85-B shovel with 5-cu.yd. Man-ten dipper at Pyramid No. 1, 75-B shovel with 5-yd dipper at No. 3. At both, drilling on 8- to 10-ft, centers is done by Hardsocg vertical augers. Holes are loaded with Atlas pellet ("Apcodyn" in wet holes).

Streamline mine, Southwestern Illinois Coal Corporation, employs a Marion 5560 electric shovel with 26-cu.yd. welded manganese-steel dipper to uncover 6 ft. of No. 6 coal under an average overburden of 37 ft. Over the coal in some

Two rotary units drill the overburden at Pyramid No. 3 mine.



areas is a black slate up to 6 ft. thick. It is followed by 5 to 15 ft. of limestone which comes down on the coal when the slate is absent. Over the lime is 1 to 10 ft. of shale followed, in over 35-ft. burden, by the Bankston Creek lime 2 to 7 ft. thick. Average hard-material thickness is 20 ft.

The stripping unit is fitted with a 102½-ft. boom and a 65½-ft. dipper handle. Normal cut width is 45 to 50 ft, and a 30-ft. berm is left for haulage. Some fourteen old deep-mine areas of various sizes have been worked over without difficulty. Mats are used over old rooms, if required, but normally they are found to be caved solid. Streamline auxiliary equipment includes a Marion 39-A dragline with 3½-cu.yd. Page bucket (road construction, ditching, etc.), an RD-8 tractor with LeTourneau bulldozer and an 8-cu.yd. LeTourneau "Carryall"

# scraper (box-cutting and other work). Bank Shot With Oxygen

Four 29-T units handle most of the overburden drilling and are supplemented by a home-made sidewall drill where conditions are favorable. Spacing of the 6½-in. vertical holes is substantially as follows: 7 to 10 ft. of hard material, 20-ft. hole spacing; 10 to 15 ft., 21 ft.; over 15 ft., 22- to 23-ft. spacing. Holes are staggered. Shooting is done with Airmite, with oxygen from a 100-liters-per-hour mine plant. Cartridge weight averages 14 lb. freshly soaked, of which 10½ lb. is oxygen. Holes are filled to the top of the hard material.

Coal is loaded at Streamline by a Marion 4121 electric shovel with 7-cu.yd. aluminum-alloy dipper installed in 1937. Usually it is shot with U.S. pellet in which the detonators are installed by the manufacturer. Holes are put down by a Hardsocg vertical auger.

With an average of 60 ft. of overburden (52-ft. minimum, 70-ft. maximum) in its present field, Burning Star mine, Truax-Traer Coal Co., uses a 750-B shovel with 105-ft. boom, 61-ft. sticks and 17-cu.yd. Man-ten dipper with a Marion 360 dragline with 150-ft. boom

and 10-cu.yd. Bucyrus-Erie bucket to uncover 6 to 7 ft. of No. 6 coal. The 17-cu.yd. Man-ten dipper (manganese door) replaced a 12-cu.yd. steel unit about five years ago. Loaded weight of the 17-yd. dipper, one of several in the region with a retarder to reduce door slap, is less than loaded weight of the old 12-yd. dipper.

Burning Star auxiliaries include a 50-B dragline for ditching and miscellaneous work, a D-6 tractor and bulldozer used ahead of the loader, an International T-40 tractor with a rotary broom for cleaning off the coal, a road patrol, and two D-8 tractors with 92cu.yd. Bucyrus-Erie scrapers for ditching, road building, box cutting, eliminating overburden peaks and other dirtmoving work. The two scrapers at the time of the Coal Age survey were engaged in opening a box cut. Average performance was 700 cu.yd. per machine shift over an average one-way haul of 750 ft. As compared with a shovel and dump trucks, cost with the scrapers is about half.

#### Shovel Yardage Rises

A typical Burning Star log shows 2 ft. of black slate over the coal followed by 6 ft. of limestone, 25 ft. of shale, 4 ft. of sandstone and clay and surface material. Average hard-material thickness is 40 ft. The dragline normally takes off the soft stuff to the sandstone, leaving the hard to the shovel. Shovel yardage, due to better pit supervision, maintenance, etc., has risen from 859 per hour in 1938 to 1,176 in 1939 and over 1,100 in 1940 to date. Usual cut width is 55 ft. and a 30-ft. berm is left for haulage.

Three 29-T vertical drills and two Sullivan "Stripborers" are used for drilling overburden. Normally, about two-thirds is handled by the sidewall units and one-third by the vertical drills—chiefly where the sandstone is heavy or the black slate over the coal thins down and prevents sidewall operation. In general, one horizontal hole has been found equivalent to three vertical holes in overburden breakage, and a sidewall

unit can drill more holes per shift. Shooting is done with either liquid oxygen or du Pont No. 4 "Red Cross," the latter, in 5-in. cartridges, in sidewall holes on 18- to 30-ft. centers. Normal loading is 210 lb. of explosive distributed over 20 to 25 ft. of the average 55-ft. hole. Vertical holes normally are drilled on 18- to 21-ft. centers and where limestone is present are filled with liquid-oxygen cartridges to the top of this lime stratum.

Coal is shot with 1\( \frac{1}{4}x6\)-in. Monobel C (Sullivan pneumatic drills and portable compressor). Loading is done by a Marion 4101 electric shovel with 5-cu.yd. Man-ten dipper.

Heavy overburden also characterizes Fidelity No. 11 mine, United Electric Coal Cos. Here, the No. 6 seam, averaging 6½ ft. in thickness, is overlaid by 45 to 70 ft. or more of material, with the average running 57 ft. Over the coal is 0 to 4 ft. of black slate or shale capped by 6 to 24 ft. of limestone. Average limestone thickness is 16 ft.

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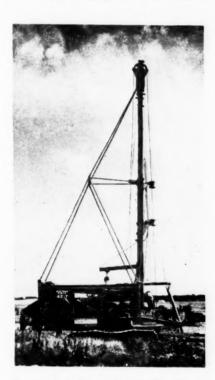
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Two pits are operated at Fidelity No. 11. Stripping equipment in No. 1 con-



New vertical churn drill at Fidelity No. 11.

sists of a Marion 5480 electric shovel (90-ft. boom, 64-ft. dipper handle, 15-cu.yd. American Manganese Steel Co. renewable-lip dipper) and a Marion 5600 shovel (120-ft. boom, 72-ft. dipper handle and 26-cu.yd. Man-ten dipper). The 5600 unit, built in 1929 and still the largest in all respects but dipper capacity, originally was equipped with an 84-ft. handle for a maximum dumping height of 82½ ft., a cutting height of 97 ft. and a dumping radius of 146 ft. These naturally have been reduced some in re-



This 26-cu.yd. electric shovel does the stripping at Streamline.

building and boom shortening in 1938 to increase dipper capacity from 15 to 26 cu.yd. This included adding ballast, changing gear ratio and adding eighteen circle rollers, done by decreasing roller diameter 1 in. Plans now are up for converting the 5600 machine to a dragline and buying a new shovel to go with it.

No. 2 pit is a tandem operation (5480 shovel and 5480 dragline with 175-ft. boom and 14-cu.yd. bucket, increased from 12 cu.yd.). As at No. 1, the No. 2 shovel is equipped with a renewable-lip "Amsco" dipper, these 15-cu.yd. units replacing the original 12-cu.yd. equipment. The dragline, working ahead of the shovel, takes off the clay and deposits it behind the rock retaining wall made by the shovel spoil. A steeper angle of spoil repose is possible and danger of slides is reduced.

# 920 Cu.Yd. per Hour

Stripper performance when Fidelity was visited was as follows: 5480 shovels, 650 cu.yd. per hour; 5600 shovel, 920 cu.yd. per hour: 5480 dragline, 420 cu.yd. per hour. Auxiliary equipment, in addition to a utility dragline, includes D-6 and 7 and T-40 tractors (one each) with LaPlant-Choate bulldozers and Bucyrus "Bullgrader."

Fidelity uses a Sullivan "Stripborer" for about 5 per cent of the overburden where the black slate is sufficiently thick for an adequate cushion over the coal. King "Detonite" is used in sidewall holes. Vertical drilling equipment now includes one new Bucyrus-Armstrong 42-T blast-hole machine. Eventually, four of these will replace six old Armstrong units—three at each pit. Vertical holes at present are drilled on 24x27-ft. centers. Hole diameter is 9 in., which compares with 6-in. and a hole spacing of 19x20 ft. in earlier years. The 9-in. hole was adopted after tests showed it

permitted a greater concentration of explosive in the rock. Thus, cubic yards broken per foot of hole drilled was increased some 25 per cent with only a slightly higher drilling cost. Better fragmentation and heaving of the limestone also have materially increased stripper efficiency.

All vertical holes are loaded with L.O.X., the liquid oxygen coming from

Delta vertical-auger overburden drill at work. The regular tractor engine has been replaced with an electric motor. Swinging racks on each side of the mast hold auger sections.





Drilling coal with a new-type rubber-tired vertical auger at Fidelity No. 11 mine.



One of the two types of drilling equipment at Fidelity No. 11 (sidewall machine).

a 220-lb.-per-hour mine plant. Cartridge length is approximately 3 ft. and total weight is around 32 lb. when loaded, of which about 24 lb. is oxygen. Holes are filled to the top of the limestone. Liquid-oxygen consumption averages about 1 lb. per ton of coal produced.

Three Marion 490 electric shovels

(sometimes two) with 4½-cu.yd. dippers (originally 3 cu.yd.) load the coal at Fidelity. First, however, it usually is shot with du Pont pellet powder. Holes are drilled with new Hardsocg vertical augers with rubber-tired wheels for easier movement.

Drainage at southern Illinois strip mines follows conventional lines and in-

cludes ditching on the high wall to prevent water entering the pit and to carry away any that it pumped out. Pit pumps run in size from 1 to 8 in., the latter usually in permanent or semi-permanent locations. Suction and discharge lines normally are hoses, with pipe in some cases, particularly from permanent or semi-permanent stations.

# TRANSPORTATION

# Southern Illinois Strip Mines

AUTOMOTIVE haulage, first installed in the district in 1934 at the Coal Strip mine, Coal Stripping Co., now Pyramid No. 3, is used at all but two of the southern Illinois shipping properties covered in the Coal Age survey. These employ steam haulage, but one is to be partly converted to a combination of steam and automotive equipment. With increases in loading-shovel dipper capacity, plus a desire for greater efficiency, size of haulage units is growing, in turn necessitating more powerful engines, many of the diesel type,

Steam-haulage operations include Pyramid No. 1 mine, Pyramid Coal Corporation, and Fidelity No. 11 mine, United Electric Coal Cos. "Circle" haulage is used at Pyramid No. 1 mine (six miles of 90-lb.-rail track), where 13-car trips of 5- and 8-ton Western side-dump cars enter the pit at one end and come out at the other. Passing tracks are eliminated in the pit but about one mile of

double track extends from the dump to the pit end. Eight steam locomotives (Porter and Vulcan) with two Baldwin spares do all the hauling. Empty and loaded tracks are kept to a maximum grade of 1.3 per cent, the limit for efficient operation without excessive wheel slippage. Every three to four years, the surface track, used to complete the circular haul, must be moved back about ½ mile. Maximum pit length has been reached, so future hauls will be shorter.

At Fidelity No. 11, 30 standard-gage

Table 1.—Automotive-Haulage Data for Certain Southern Illinois Strip Mines

Mine	Type Tractor	Type Semi- Trailer	No. Units in Use	Maximum Round-Trip Haul, Miles	Maximum Road Grade, Per Cent 1	Avg. Daily Mine Out- put, Tons <sup>2</sup>
Bankston Creek No. 6	Autocar	Austin-Western,				
		20-ton 3	8	6.6	61/2	3,200
Burning Star	Euclid	Euclid, 20-ton	125	7	61/2	4,000
Delta		Sanford-Day			-, -	
		15-ton	7.6	3 avg.	712	2,750
McLaren	1 International	Austin-Western,		0	. / 2	-,
	3 White	10-ton	4	11/2	5	1,200
Pyramid No. 3	White	Austin-Western.		- / 4		
		25-ton	8	41/2 avg.		5,000
Streamline	Mack	Garwood, 30-ton.		-2 4 0		
		side-door dump	10	8	0.9	5,000
Fidelity No. 11, Pit No. 1	Autocar	Garwood, 25-ton.				
		side-door dump	7			

<sup>&</sup>lt;sup>1</sup> Figures given are for ramps and inclines; grades on main roads seldom exceed 2 per cent. <sup>2</sup> Prepared coal ready for shipment, which may represent but 75 per cent or less of the total. <sup>3</sup> Tandem units used (one 20-ton semi- and one 20-ton full trailer per unit). <sup>3</sup> Maximum 2 per cent on all new roads. <sup>3</sup> Ten in service, two on order. <sup>6</sup> Coal also hauled on return trip by 20-ton Dart end-dump refuse truck.

American Car & Foundry Co. 40-ton drop-bottom cars and seven Heisler 42ton geared locomotives move coal from two pits a maximum of 13 miles to the dump. Present 70-lb. track is to be replaced with 85-lb. Trips of five cars are headed into the pits and two passing tracks in and one out of each pit eliminate interference. Pit No. 1, however, is being converted to combination haulage. Seven Autocar trucks (Cummins diesel engines) pulling "Garwood" 25-ton side-dump semi-trailers will haul to the end of the pit and dump sideways over a ramp into the present 40-ton railroad cars.

Automotive-haulage operations normally use tractors powered by gasoline or diesel engines pulling semi-trailers with capacities of 12 to 30 tons. One exception is Bankston Creek No. 6 mine, Bankston Creek Collieries Co., an affiliate of the Sahara Coal Co., which operates tandem units—one semi and one full trailer behind a single tractor. Round-trip hauls vary from 1½ to 8 miles at the various operations studied.

Ten Euclid tractors with 145-hp. gasoline engines pull Euclid bottom-dumping semi-trailers (equipped with cable-operated automatic-rewinding door-closing mechanisms operated off the rear wheels) at the Burning Star Mine, Truax-Traer Coal Co. Minimum haul to the present pit is 6 miles; maximum, 7. Maximum grade is 6½ per cent. With a longer haul, two additional Euclid units powered by 150-hp. Cummins diesel engines are being purchased.

## Semi-Trailers Installed

To furnish the higher capacity necessitated by a growing haul, Streamline mine, Southwestern Illinois Coal Corporation, has discarded trucks in favor of tractor-semi-trailer operation. special bodies on the original Mack haulage units (Coal Age, September, 1937, p. 50) were removed and the chassis shortened to convert them into tractors to pull new 30-ton semi-trailers. These consist of "Garwood" bodies (Inland "Hi-Steel," air-operated side-opening doors) on Fruehauf running gear. Semi-trailer weight is 27,000 lb.; tractor weight, 9,000 lb. In view of the greater load on the tractor engines and the fact that they had reached an age when maintenance cost was sharply up, an experimental Cummins 200-hp. 6-H.S.D. supercharged diesel engine was installed. On trial, this engine averaged 42 gal, of diesel fuel per day (100 to 110 miles), compared to 75 to 90 gal. of gasoline by the gasoline engines. The diesel unit was able to travel up grades in a 1 to 14 higher gear, thus raising average peed on the loaded trip and making it unnecessary to operate at maximum on return. All ten of the present aulage units now are being equipped with these engines. Present round-trip haul is 8 miles (0.9 per cent maximum grade).

Eight White tractors with 25-ton rated,

27.5-ton-capacity Austin-Western trail cars haul from the pit at Pyramid No. 3 mine, Pyramid Coal Corporation. The average round trip is 4½ miles and the gasoline engines average 1.4 miles per gallon, Each unit travels 73 miles per day.

Originally using six haulage units, Bankston Creek No. 6 mine, because of pit extension, now employs eight Autocar tractors each pulling in tandem a 20-ton semi- and a 20-ton full trailer (Austin-Western). The last two units were built with "Man-ten" bodies. Seven of the tractors are powered by 125-hp. gasoline engines, with a recently installed 150-hp. Cummins diesel engine in the eighth. The units average 105.6 miles per day over a round-trip ranging from 3 to 6.6 miles. Maximum grade is  $4\frac{1}{2}$  per cent, with 2 per cent on all new roads.

One International and three White tractors with 90-hp. engines haul 10-ton

rated, 12-ton-capacity, Austin-Western trail cars at the McLaren mine, McLaren Coal Co. The units travel about 30 miles per day over a 1½-mile round-trip route and average 3 miles per gallon of gasoline. Grades are kept to 5 per cent.

Haulage at the Delta mine, Delta Coal Mining Co., is handled by eight units, seven of which are Autocar tractors pulling 15-ton Sanford-day drop-bottom semi-trailers. Over an average haul of 3 miles and with grades running up to 7½ per cent on the ramps the 125-hp. Waukesha gasoline engines average 2½ to 3 miles per gallon. eighth unit, a 20-ton Dart truck with 175-hp. Hercules gasoline engine and hydraulie end-dump body, was installed to haul gob to the pit and return with coal. As at most of the mines studied, lengthening hauls at Delta also have necessitated greater capacity, which is being obtained by adding 6-in. sideboards



Loading 30-ton side-door-dump semi-trailer units at Streamline mine.



Tandem haulage units (20-ton trailers) in the Bankston Creek No. 6 pit.



20-ton semi-trailers being loaded at Burning Star.



Installing a supercharged 200-hn. diesel engine in 30-ton haulage unit at the Streamline mine.



In the pit at Delta. A 15-ton semi-trailer being loaded.

to raise body capacity to 18 tons. Tractor reconstruction to meet this increase includes a heavier rear-end, 16-leaf in place of 13-leaf springs and 175-hp. Waukesha gasoline engines.

Haulage units normally operate on the coal, except in emergencies. Berms along the high wall vary from 12 to 30 ft. in width. Methods of entering the pit include runways through the spoil, ramps down the high wall and entrances at the pit ends. The latter practice prevails at Streamline mine, where the main road goes in one end of the pit, rendering construction of ramps and runways unnecessary. Haulage units travel on the coal going in and coming out. At McLaren, three ramps cut in the highwall about 1,000 ft. apart will serve as the pit entrances. This same procedure will be followed at Burning Star, except that the principal entrance will be at the center of the pit, the haulage going either way from the bottom of the incline. Other operations commonly use runways through the spoil at either end of the pit.

The runway system is extended to entrances at regular intervals at other southern Illinois operations. At Delta pit, for example, the main road was built on the outcrop and runways were established on 1,000-ft, centers through the spoil to the haulage berm in the pit, haulage units going in one runway and coming out another. This same system has been installed at Bankston Creek No. 6, with the runways on a maximum grade of 2 per cent.

## Better Roads Built

Stimulated by more complete cost records and increases in the size of haulage units, road construction has been characterized by continuing improvements. Most roads are laid out by engineering crews, are 40 to 50 ft. wide with adequate subgrades and drainage ditches and usually are built on grades not exceeding 2 per cent except at ramps, runways or inclines. Subgrades, sometimes running 3 to 5 ft. thick, usually are made of compacted gob or rock surfaced with crushed limestone. Maintenance equipment varies from road graders to Nos. 10 and 12 Caterpillar "Auto Patrols" at Delta and Bankston Creek. At Burning Star, roads are sprinkled continuously on operating days (p. 156).

Limestone for surfacing roads usually is purchased, although a few operators have installed their own crushing plants. At Streamline, for example, a 15x36-in. jaw crusher is operated on idle days to break limestone to 1½ in. for storage until needed. The limestone is gathered up by the regular pit crew using the loading shovel. Plant capacity is 250 tons per shift.

Tire life varies from 10,000 to 30,000 miles at the strip mines visited by *Coal Age*. Most favor tires with lug-type treads. When sidewall breaks are not too severe, several operators send dam-

aged tires to the manufacturer for vulcanizing. The 20-ton haulage units at Burning Star are equipped with two 18x24 tires under the rear of the semitrailers and tractors and two 11.25x24 tires on the front of the tractors. An average tire life of 2,400 hours (about 10 m.p.h.) is the goal.

Streamline mine, with 30-ton semitrailers, uses eight 11.25x24 14-ply lugtype tires on the trailers and four 13.50x24 18-ply lug-type tires on the rear and two 11.25x24 14-ply diamond-tread tires on the front wheels of the tractors. Average tire life is 20,000 miles at Pyramid No. 3 mine, using 16-ply tires on 27½-ton semi-trailers.

At McLaren, employing 12-ton semitrailers, 10.50x20 tires are used on the semi-trailers and the rear of the tractors, with 9.75x20 tires on the front wheels, a total of six per unit. Tires have crossbar-type treads. The originals have traveled 7,000 miles to date and are still in use. New purchases will be 9.75x20 excavator-tread tires, as the straight sidewalls are expected to reduce sidewall breaks. The 15-ton semi-trailer units at Delta are equipped with four 12x20 tires, with 12.50x24 tires on the tractor. The lug type is preferred. Tire life averages 25,000 miles on tractors and 27,000 miles on semi-trailers.

# POWER AND ELECTRIFICATION

# Deep Mines in Southern Illinois

SINCE the coal industry's first fly-wheel-Ward Leonard-controlled hoist was installed at a southern Illinois mine, in 1912, that district has maintained its place in "things electrical." All electric power is purchased at 44 per cent of the shaft mines covered in the Coal Age power and electrification survey. Of this group, 75 per cent use electric hoisting and the balance steam. At 22 per cent of the mines all electric power is generated locally; without exception, hoisting is by steam. At the remaining 34 per cent, also hoisting with steam, part of the power, usually d.c., is generated and the rest purchased.

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Both the Zeigler No. 1 and No. 2 mines, Bell & Zoller Coal & Mining Co., operate plants generating all power for both mines and a central preparation plant at No. 2. Steam is raised at No. 1 by four 412-hp. Heine boilers with Green chain-grate stokers fueled principally with 1-in. dedusted screenings. A 2,500kva. high-pressure (150-lb.) and a 750kva. 2,300-volt mixed pressure turbogenerator (steam-hoist exhaust) generate a.c. The same make of boilers and stokers are used in the No. 2 plant. Here, the six 365-hp. boilers working at 160 lb, pressure consume principally 13. in, dedusted screenings. The largest generating unit is a 4,000-kva. turbo-generator added in 1935 when the central cleaning plant (2,287 connected-horsepower) was built. The other unit is a 1,875-kva. turbine.

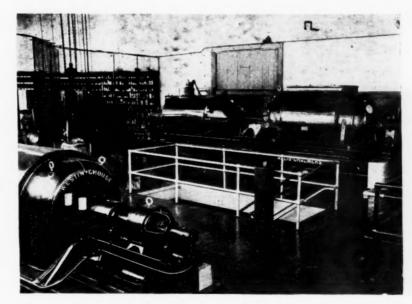
The Consolidated Coal Co. generates all power for Jefferson No. 20 (one plant) and New Monarch and Buckhorn mines (second plant). Jefferson No. 20 fuel is crushed bony pickings plus some 10-mesh dust. Harrington chain-grate stokers under three 460-hp. boilers raise steam at 200 lb. pressure and

200-deg, superheat. Exhaust hoist steam operates a 1,000-kw. mixed-pressure turbine, in addition to 500-kw, and 1,500-kw, high-pressure units. Crushed pickings also is the principal fuel at New Monarch, where equipment consists of four 450-hp, boilers with chain grates and two turbo-generators (750 kva. and 2,500 kva.) for 2,300-volt power.

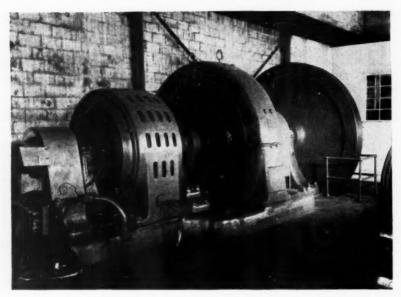
Companies generating part of their power include the Franklin County Coal Corporation, Peabody Coal Co., and Chicago, Wilmington & Franklin Coal Co. Franklin County's Royalton No. 7 contains two 402-hp. boilers (Combustion Engineering Co. underfeed stokers) and three generating units (two 200-

kw. d.c. and one 400-kw. a.c.). Only d.c. is generated at Energy No. 5, the other Franklin County mine, where equipment comprises three 280-hp. hand-fired boilers and one 200- and one 300-kw, generators. Both plants include high-pressure steam accumulators for smoothing hoist demand.

Minus-28-mesh carbon constitutes a considerable part of the fuel at Peabody's Majestic No. 14 and Harco No. 47 mines, both generating some d.c. Boilers burning this fuel are equipped with Illinois spreader-type stokers, At both plants, however, some boilers are hand-fired, usually with spillage. Another Peabody mine generating some



Turbo-generator capacity is 2,275 kva. in this Bell & Zoller plant supplying Zeigler No. 2 mine and the central preparation plant.



Coal's pioneer flywheel set for Ward Leonard hoist control installed at Old Ben No. 11 in 1912 and still working.

d.c. is Harrisburg No. 43 (six 150-hp. hand-fired boilers and one 300-kw. d.c. engine-generator). At Peabody's Black Arrow No. 18 mine, where hoisting is the principal steam demand and no power is generated, four h.r.t. boilers (150- and 200-hp.) are fired with Illinois spreader stokers using minus-28-mesh dust. One 150-hp. boiler is hand-fired with spillage.

Orient No. 1 mine, Chicago, Wilmington & Franklin Coal Co., completes the list of those partly generating power. Wicks boilers with either Illinois stokers handling minus-48-mesh or chain-grate stokers are in use. On the chain-grate stokers, crushed picking-table refuse (about 20 per cent ash) is the fuel. Direct current is generated by enginegenerators.

## Steam Used for Hoisting

All the above mines operate steam hoists. Another is Old Ben No. 15, Old Ben Coal Corporation, where purchased power has been used since 1922.

At electric-hoisting mines purchasing all their power, energy requirements average 6.47 kw.-hr. per ton of coal shipped. The range is 5.15 to 7.68 kw.hr. per ton, compared with mine capacities of 3,600 to 10,000 tons per day. Hoisting-shaft depths are 260 to 601 ft. Underground consumption figures at three mines are 2.4, 2.52 and 4 kw.-hr. At New Orient 10,000 tons is raised up a 500-ft. shaft in balanced skips by a 4.000-hp, electric hoist. The 15-minute maximum demand is 5,900 kw. Power requirements and distribution for another large skip hoisting mine, Kathleen, Union Colliery Co., are given in Table I.

Except for two of the six underground d.c. substations at Kathleen, synchronous motor-generator sets rather than converters are used at deep mines. Hoist motors or motors on hoist motor-generators, fans, tipple and preparation ma-

chinery, etc., are of the induction type. Consequently, capacitors are installed at several operations to supplement the power-factor-corrective effect of synchronous d.c. substations. Since the installation three years ago of a 660kva. General Electric capacitor at the Valier mine, Valier Coal Co., power factor has averaged 99.9 per cent. Another General Electric installation, 90kva., is at Harco No. 47. At Black Arrow No. 18, 150 kva. of Westinghouse capacitor units has been installed at the fan. driven by a 150-hp, induction motor, Of these, 90-kva. recently installed are the new "Inerteen" type. Another Inerteen installation, in June, consists of two banks at Kathleen mine. One, 135 kva., is in the main hoist house, and the other, 180 kva., is at the main a.c. transformer substation near by. These raised power factor from 95 to 99.5 per cent. All these southern Illinois capacitors are on 2,300-volt lines.

## Synchronous Condenser Used

To raise power factor and increase capacity of a 2-mile 2,300-volt transmission line, a synchronous condenser is installed for emergency use at Zeigler No. 2. The alternator of an enginegenerating unit was disconnected, the flywheel removed and a 25-hp. d.c. motor installed with a flat bolt over the exciter belt. The alternator is started with the d.c. motor. Then, after synchronization and tying in with the a.c. system. the power switch of the d.c. motor is opened. Over-excitation of the 675-kva. synchronous motor without mechanical load provides the necessary leading current when No. 2 power plant is down for repairs and it is desirable to carry the No. 2 washer load from the No. 1 power plant at No. 1 mine. Ordinarily, the two power plants are not connected.

Old Ben buys power at a central metering point at No. 8 for its four

mines (Table 11). Distribution is at 33,000 volts. Three 667-kva. 33,000/2,300-volt transformers supplying No. 8 mine are typical of the company transformer substations. Old Ben, like other companies in the district, has no automatic power-demand limiters. Opinion in the field apparently is that demand limiting interruptions do not pay.

The first flywheel (Ilgner)-Ward Leonard hoist control in coal was installed at Old Ben No. 11 and continues in efficient operation today. Motor-generator, d.c. hoist motor and controls were built by General Electric. The flywheel is mounted outboard at one end of the shaft as compared with the modern design with the flywheel in a case between motor and generator.

## 4,000 Hp. Drives Hoist

The Nordberg hoist with 11x17-ft. step-up cylindro-conical drum driven by two 2,000-hp. 75-r.p.m. d.c. Westinghouse motors at New Orient mine still holds first place in size in the coal industry by a wide margin. The flywheel set (Westinghouse) is driven by a 2,200-hp. 2,200-volt induction motor and includes two 1,650-kw. 600-volt 575-r.p.m. d.c. generators. Flywheel weight is 45 tons. Maximum speed attained during the 640-ft, total lift is 4,000 f.p.m.

At Valier, where the skip hoist operates in a 600-ft. shaft, the 1,350-hp. General Electric d.c. motor (Ward Leonard control) recently was equipped with a cooling system to increase capacity to 7,500 tons in 7 hours. One end of the motor was cased and receives 3,000 c.f.m. of air from which the dust is removed by an oil filter.

Electric coal hoists are used at six of the large southern Illinois mines. In every case they are controlled by flywheel-Ward Leonard equipment, this control, with one exception, being semi-



Filtered air cools this 1,350-hp. d.c. motor driving the Valier hoist. The box containing fan and filter appears in the background.

automatic, that is, starting acceleration is manual but slowing and stopping are automatic.

Practically all deep mines surveyed by Coal Age take a.c. power underground (exceptions include Old Ben and Energy No. 5). Its principal use is driving d.c. substations, but several mines use a.c. motors on mining and transportation equipment.

At all mines except New Orient the a.c. power intake is 2,300 volts. It was 2,300 volts at New Orient until 1936, when it was changed to 4,000 to obviate an increase in underground cable capacities, reduce power loss and provide for the normal progress of mining (Coal Age, August, 1936, p. 321). Lead-sheathed wire-armored cable in the airshaft conducts 4,000 volts underground. Distribution along entries consists of 22,000 ft. of the original three-conductor, varnished-cambric-insulated, lead sheathed cable protected by flat steel armor and jute.

Most cables in New Orient still are in the airways as originally. Present practice is non-metallic covered cable (containing ground wires) hung in the upper right-hand corner of the main haulway (steel messenger with marlin ties). The neutral of the Y-connected main transformers is grounded and the mine rails are used as a part of the grounding system because the original cables are without ground wires.

# A.c. Employed Underground

Valier uses 220 volts a.c. for cutting, drilling and loading. Kathleen employs it for cutting and drilling. Except for battery-operated rubber-tired haulage equipment, Blue Bird No. 6 mine, Blue Bird Coal Co., is a 100-per-cent 220volt a.c. operation. Buckhorn, the new Consolidated slope, has 220-volt a.c. motors on the belt and chain conveyors in one section and on the feeders and a pump at the slope bottom. In the new Bankston Creek No. 5 slope, Bankston Creek Collieries Co., affiliated with the Sahara Coal Co., 440-volt a.c. motors drive the car haul, dump and feeders on the bottom.

At Valier, the 2,300-volt a.c. supply is taken in via a three-conductor 750,000-circ.mil lead-sheathed wire-armored cable in the 600-ft. auxiliary shaft. Distribution along entries to a.c. transformer and d.c. substations is via 3-conductor trench-lay-type non-metallic covered cable (mostly 1/0) on the bottom in aircourses (not in trenches). First branching of the main line is in a switch room on the bottom containing four panels, each with overload oil circuit breaker and indicating ammeter. Each panel feeds three lines through disconnect oil oircuit breakers.

Numerous 2,300-volt stub-end and tie oil circuit breakers are used. All breakers underground are marked with numbers corresponding to those on a drawing (Fig. 1) in the motor pit. In case of 2.300-volt cable trouble, instructions to

manipulate certain numbered breakers to clear the difficulty or reestablish service are phoned by the underground electrician.

The sten-down from 2,300 to 220 volts a.c. for cutting, loading and drilling at Valier is handled by 33 portable transformer sets, each consisting of three 25kva, units. In a fireproof steel box with the transformers are mounted three single-pole cutouts (fused to 40 amp.) and an oil circuit breaker. On the secondary side (mounted out on the end of the box) is a triple-pole 200-amp. safety switch fused to 400 amp. Lines distributing 220-volt power consist of three single-conductor 4/0 weatherproof stranded wires hung on porcelain knobs on the roof. The length limit for 220volt lines is 1,200 ft. Bare spots every 100 ft. permit nipping when operating or tramming cutters and loaders.

#### Cables Carry Mine Power

Lead-sheathed and wire-armored 4/0 and 1/0 cables, suspended in two 260-ft. airshafts, carry 2,300-volt power into Kathleen mine. Rubber-insulated and rubber-jacketed Simplex-Anhydrex cable purchased in 500-ft. lengths is the present standard for entry installations. This cable is buried in the fireclay bottom on the haulage roads, Fifteen 75-kva. transformer substations supply 220 volts to the cutting machines. Two are in portable steel boxes and thirteen in fireproof rooms in which doors are held open by cotton cord around the transformer covers. Transformer rooms also contain fused primary cutouts and an oil switch without overload release. Cutouts in series with an oil switch also is the practice on 2,300-volt branch circuits; these are inclosed in tile cabinets with normally closed steel doors. For 220-volt distribution along panel entries, three 4/0 single-conductor solid weatherproof wires are hung on the

## Table I—Power Data, Kathleen Mine, Union Colliery Co.

Kilowatt-hours per ton shipped	6.95
Percentage distribution of total	
Hoist	6.9
- Ventilation	12.7
Hoisting men and materials	2.0
Locomotives and loading ma-	
chines	38.6
Mining machines, pumping and	
mine lighting	28.0
Tipple and screening plant	5.8
Top lighting and water supply.	2.0
Transformer losses	4.0
Shipped production, 5,300 ton	s per
day: shaft depth, 260 ft.; electric	
ing; cutters, a.c.; loaders, d.c.	
The state of the state of the	



Overhead in this arched doo's way at the bottom of the Valier auxiliary shaft is the 3-conductor 750,000 - circ, mil, armored cable which supplies 2,300-volt power to the whole mine.

roof, ribs or props. Each panel is on a separate circuit served by a non-fused safety switch.

Three single-conductor rubber-jacketed "Okolite" wires in a 192-ft. borehole constitute the 2,300-volt feed into Buckhorn mine and along the entries to the transformers. They lie on the floor near the rib and are covered.

Power at 2,300 is taken into the 100per-cent a.c. Blue Bird No. 6 mine through a 110-ft. borehole by General Electric No. 4 cable, parkway type, with non-metallic jacket and ground wires connected to a ground wire carried on the pole line. From the borehole bottom the cable, hung on cap pieces or short crossbars over pairs of posts set close together, is extended 1,600 ft. to the farthest transformers. Weatherproof No. 4/0 wire carries 220-volt a.c. to entryconveyor motors and nip stations for cutters, drills and loading machines.

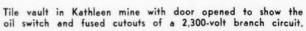
Slope haulage at Bankston Creek No. 5 is handled by a belt 54 in, wide, 15/16 in, thick and 765 ft. long (centers distance). A General Electric 440-volt Type KF 40/20-hp, two-speed motor with Thrustor brake drives the two-car rotary dump through a Falk reducer, A Type MR wound-rotor 40-hp, totally inclosed motor operates the car haul, with a Type K 15-hp, unit for the coal feeder (Reeves

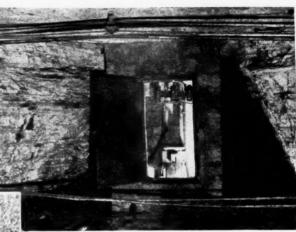
Table II—Power Data, Year 1939, Old Ben Coal Corporation (Average Power Factor, 99 Per Cent)

		Mille Killow	att-mours	
	No. 8	No. 11	No. 14	No. 15
Fan	370,635	515,360	848,400	419,859
Hoist	565,100	633,060	393,306	14,470*
Balance of mine load	2,371,148	2,168,282	2,951,394	2,402,566
Total	3,306,803	3,316,783	4,193,100	2,836,895
Kilowatt-hours per ton	6.63	7.06	7.68	5.15
Tons shipped	547,953	469,668	545,744	550,737
Tons per shift	4.200	3,600	3,800	3,500
* Auxiliary electric hoist. Coal	hoisting at	this mine is	by steam.	Other three
mines have electric coal hoists.				

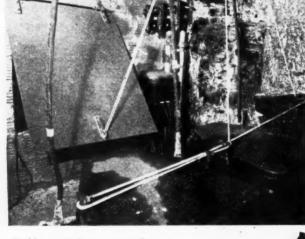


In Valier, the 2,300-volt switches are designated by numbers corresponding to those on a circuit print kept in the motor pit and mine office.





Three single wires entering through a borehole and carried on the bottom in the entry bring 2,300-volt power into Buckhorn.



Kathleen stationary transformer substations underground are in fireproof vaults with doors that close by gravity if the cotton ropes looped over the transformer covers burn.



Newest 2,300-volt borehole cable at Harco No. 47 mine (three-conductor No. 4/0 rubber jacket and braid, supported in the 362-ft. borehole by a wooden clamp resting on top of the casing).



An air-vane switch stops the Kathleen 500-kw. substation if ventilation by this blower unit should cease.

variable-speed gear with motor-driven change and Weston tachometer-magneto speed indicator). The rock feeder is driven by a 10-hp. Type K motor, Tandem pulleys working on the return run near the idler head pulley and geared to one 300-hp. Type MR motor operate the slope belt.

Two Westinghouse 2,300-volt Type CW motors, each geared separately to tandem pulleys engaging the return run, drive the 900-ft. 36-in. slope belt at the new Buckhorn mine. Motor sizes are 100 and 40 hp. The latter principally maintains tension on the belt as it wraps over the main driving pulley. To prevent the 40-hp, motor taking an overload and to provide a differential effect, sufficient resistance is fixed in the secondary circuit to cause it to drop speed slightly more with load than the larger motor.

#### Split Clamps Hold Cables

All late 2,300-volt a.c. borehole installations at Peabody Coal Co. mines are "Okolite" three-conductor rubber-and-braid cable, principally in the 4/0 size. The main suspension is a split wooden clamp 24 in. long on top of the casing. Strain insulators on the conductors constitute the secondary support.

Most or all d.c. substations are underground at mines included in the electrical survey. Distribution voltage is nominally 275. Two years ago, Kathleen installed a new Westinghouse 500-kw. motor-generator substation with full automatic controls ventilated by filtered air supplied by a 2-hp. d.c. blower unit. A vane and mercury switch stop the substation if ventilation fails. Last year a peak-load problem with a 150-kw. portable m.g. set was solved by installing an 1.T.E. load distributor (Coal Age, March,

1940, p. 47). Peaks caused by locomotives are minimized by automatic adjustment of the generator shunt field to reduce voltage. This portable set is operated in parallel with a larger set 6,200 ft. away.

Use of semi-portable substations in its southern Illinois mines is a recent development with Peabody. At Majestic No. 14, a portable switchboard was designed and built to embody minimum dimensions, light weight, accessibility and a practical degree of mechanical protection. Axles and wheels are at the extreme ends and L-shaped vertical frame corners leave open spaces at sides and ends.

Considerable stress is placed on fireproof underground substations at Peabody mines. Rooms at Majestic No. 14, Black Arrow No. 18 and Harco 47, for example, have floors, walls and ceilings of fireproof materials and steel doors which are closed by weights in case a 160-deg. fusible link melts. Door closing automatically opens the oil switch to shut down the station. Usually a whole split of air goes through a substation. If the substation doors close, a mine door can be opened to bypass the air. Some 8 to 10 in. of shale dust is placed over the steel ceiling to prevent expansion and cracking of the top rock and serve as a fire extinguisher if the ceiling plates should warp sufficiently.

All 100- and 150-kw. Consolidated Coal Co. substations are started across the line, making possible a very compact portable unit. The manual control

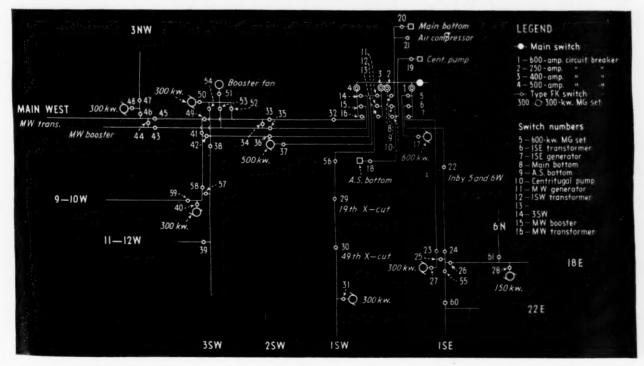
Fig. 1—Numbers on this print, kept in the motor pit and mine office at Valier, correspond to numbers painted on the 2,300-volt switches underground. apparatus is mounted on the m.g. truck—a.c. oil switch on one end and d.c. control board on the other. Four New Monarch substations have relays and automatic breakers to insert resistance in the feed line to limit output during haulage peaks. Four of the eight substations underground at Valier are equipped with load distributors which insert resistance in the generator field.

Southern Illinois' long experience in mechanical loading is reflected in adequate d.c. feeders, both in boreholes and underground. Old Ben mines are served by 2,000,000-circ.mil concentric cables suspended by the conductors in 500- to 600-ft, boreholes with 4-in. casings. Between the soft-drawn center and hard-drawn outer conductors is Simplex-Anhydrex deproteinized rubber. The outer conductor is covered with jute.

#### Concentric Cable in Borehole

Concentric d.c. borehole cables also are used at Energy No. 5 mine. The latest is a General Electric 1,500,000circ.mil cable in a 370-ft. borehole. Specifications are: two-conductor concentric, 1,500,000-circ.mil, 8/64-in. varnished cambric 1,000-volt insulation, 7/64-in, lead covering, one layer of rubber-filled tape, one layer of saturated jute and outer conductor of 23 strands of No. 2 hard-drawn copper and three No. 4 b.w.g. galvanized steel wires, with a serving of jute over all. In suspending cables, the outer conductor, instead of the usual metal clamp, is anchored by concrete grouted around it for several feet in the top of the casing-a method (also for wire-armored a.c. cables) of many years' standing at Franklin County Coal Corporation mines (Coal Age, June, 1940, p. 83).

For positive d.c. lines underground the





This portable 150-kw. m.g. substation in Kathleen mine is equipped with a load distributor to reduce peaks caused by haulage locomotives.

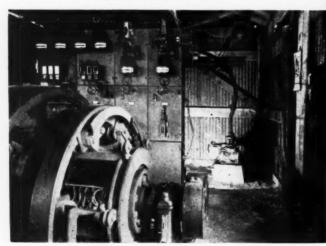
In Kathleen mine—Two 500,000-circ.mil insulated positives near the trolley wire and two bare cables of the same size together with a 4/0 wire on the rib 2 ft. from the floor.

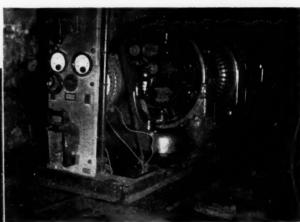


The Peabody mines use insulated positive feeders hung on spools beside the trolley, as in this view in Black Arrow No. 18.

Portable substation switchboard for Majestic No. 14.

Right background: 2,000,000-circ.mil. concentric d.c. borehole entrance in a surface substation at Old Ben No. 6 mine.





Across-line starting of this 150-kw. substation in New Monarch reduced bulk of control equipment so that it could be mounted on the motorgenerator truck.

standard is 6/0 trolley wire and parallel 250,000-, 500,000- or 1,000,000-circ.mil cables. Standardization on one brand of line materials is the usual practice and three-fourths of the mines use largely Ohio Brass products (exclusively at Old Ben). Approximately half of the properties use bare positive feeder cables—generally hung on the roof near the trolley wire. Separate hanging is widely favored but in the Zeigler mines mostly combination hangers are used. Among the companies using insulated feeder cables are Peabody, C. W. & F. and Valier. For the most part, these are hung from the roof opposite the trolley.

Locomotive circuits are separate from circuits feeding cutters, drills and loaders in New Monarch and Jefferson No. 20 mines. A 750,000-circ.mil feeder parallels the trolley and machine circuits consist of 500,000 positive and negative lines. In both positive and negative feeder cables, Peabody uses the coarsest stranding available. The insulated positive cables are hung on spools, one above the other. This plan, permitting spools to be added, is a convenient means of hanging additional feeder.

Some of the larger mines continue the 500,000-circ.mil feeders to within 500 feet of the face. Some limit the d.c. transmission distance to less than 1,500 ft. In the Peabody mines, recording voltmeter tests are made periodically at the faces to prevent average voltage dropping below 225 during the working shift.

#### Bare Returns Installed

Practically all mines use 500,000- or 1,000,000-circ.mil bare returns in parallel with the rail circuits. An exception is Valier, with 220-volt face equipment and consequently smaller d.c. loads. In Old Ben mines, negative feeders are hung from the roof opposite the trolley; in most of the others, on the rib. Panel entries commonly are fitted with 4/0 bare round wire spiked along one rail.

Most main-line hauls are laid with 60-lb. rail. However, some 70-, 85- and 90-lb. rail is in service. Welding is done at five mines. New Orient now contains 3,500 ft. of 70- and 85-lb. Thermitwelded track. All main-line track in the Bankston Creek No. 5 slope is Thermitwelded, a major reason being ease of joining miscellaneous sizes of slightly worn relaying rail. Valier has 6,000 ft. of Thermit-welded 90-lb. track.

Arc-welding is used in the three mines of the Consolidated Coal Co., which pioneered arc-welded track underground. Work was started at New Monarch in 1933, using the splice bars, veeing out the ball of the rail with a cutting torch and arc-welding in the V and around the splice bars. A few years ago total welding cost was \$0.68 per joint compared to \$1 total cost of bonding (Coal Age, July, 1936, p. 277).

Short U-bonds find a wider use than long. Peabody uses short bonds at all four southern Illinois mines and several years ago standardized on Ohio Brass.

Short Electric Railway Improvement Co. bonds are used in the Zeigler mines.

Automatic sectionalizing or tie feeder breakers are found in six mines. Valier leads with 23 new I.T.E. and old Columbus breakers in capacities from 600 to 2,000 amp. for either stub-end or tie service. They are mounted in steel cabinets made at the mine. Earlier ones had emergency handles, but eight new ones are without. In a shunt connection around each breaker a disconnect switch is installed for bypassing in emergency. Switch blades, however, are kept in the section foreman's shanty.

In Harrisburg No. 43 (Peabody) each of four shuttle-car sections is served by a new I.T.E. 600-amp. Type KWA automatic reclosing breaker. A breaker load is one 7BU Joy, one Goodman 50-

hp. cutter, one Dooley No. 473 drill and a 7½-hp. Joy elevating conveyor.

Beginning 22 months ago General Electric automatic reclosing breakers were installed in Kathleen. Eight are 1,500-amp, and four are 2,500-amp. Most are in tie-feeder service but at night some are switched to stub-end service. Signal lamps near the breakers indicate whether they are closed or open. Signals have been added to tie-feeder breakers in New Orient, where gongs ring to call attention to an open breaker.

Main-haulage locomotives in southern Illinios are mostly 13- and 15-ton sizes. One tandem unit (two 13-ton Goodman machines) is in use at Valier, which also operates two 20-ton Goodman three-motor locomotives. New Orient is another user of 20-ton locomotives. A new



In Black Arrow No. 18—looking through the steel doors, which will close automatically in case of a substation fire.

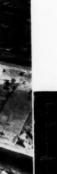


Two dozen automatic sectionalizing breakers are in use in Valier.

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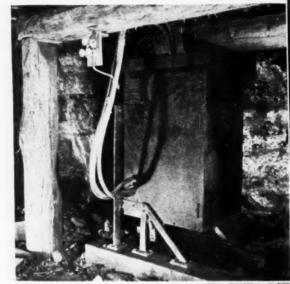
Welding proved a convenient means of joining miscellaneous-sized rails in Bankston Creek No. 5 mine.



Arc-welded track joints in New Monarch. The Consolidated Coal Co. was the pioneer in this work.



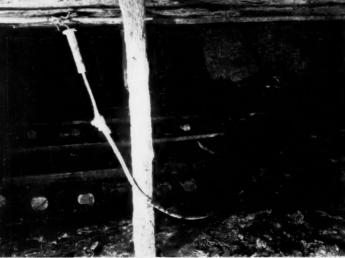
Fused nip connection on a 4/0 rubber-sheathed semi-portable floor cable in a shuttle car section in Harrisburg No. 43 mine.



This 1,500-amp. d.c. sectionalizing breaker with indicating lamp attachment is one of twelve automatic breakers installed recently in Kathleen mine.



No. 4/0 semi-portable floor cable terminating at a nipping station to which the 100-ft. loader cable is connected in Harrisburg No. 43 mine.



General Electric 20-tonner at New Orient (same general specifications as the older units) has straight 10-point parallel control with a separate overload breaker in each motor circuit which reclose when the controller returns to the first point. Parts have been purchased to change the older 20-tonners from series-parallel to parallel control. All New Orient 20-ton locomotives have Timken journal bearings.

Most of the mines employ relay, or swing, locomotives, usually one for two loading machines. The common size is 8 tons, although the range is 5 to 13 tons. On the 1,500-ft. (maximum) swing hauls in New Monarch mine, battery units are employed. Over one-fifth of the gathering or service locomotives in the district are battery-powered, but only New Monarch uses that type exclusively. Of the seventeen battery locomotives (four makes) on both service and swing hauls, sixteen are equipped with "Exide-Ironclad" and one with a Gould battery.

#### **Batteries Power Locomotives**

Other mines where battery locomotives service loaders include Zeigler No. 1, Royalton No. 7, Majestic No. 14, Valier, and Freeman Spur, Seymour Coal Mining Co. At Valier and Royalton No. 7, one battery and one cable-reel locomotive work together, thus preventing the cable interference that would result with two reel locomotives. The Valier locomotives, thirteen in number, are General Electric combination battery and trolley units (four "Exide-Ironclad" and nine "Philco" batteries).

Seven mines use slow-speed cablereel gathering, or service, locomotives, viz: Old Ben Nos. 11 and 14, Zeigler No. 2, Harco No. 47, Majestic No. 14, Valier, Orient No. 1 and New Orient. None use slow speed exclusively but at least three still are changing, as at Harco No. 47, where so far six of the eighteen Jeffrey 6-ton cable-reel locomotives have been converted from 4.8 to 3.2 m.p.h. At Orient No. 1 mine, two-thirds of the 6and 8-ton G.E. cable-reel locomotives are the slow-speed (32-m.p.h.) type and the rest 6-m.p.h. First comprehensive tests of the comparative performances of high- and slow-speed types were made at Orient No. 1 in 1926 in cooperation with General Electric engineers.

Battery-operated Joy shuttle handle part or all the tonnage at Buckhorn, Jefferson No. 20, Harco No. 47 and Harrisburg No. 43. At Blue Bird No. 6, the entire tonnage is hauled with Sanford-Day rubber-tired drop-bottom semitrailers pulled by Baker-Raulang battery tractors. Shuttle cars are equipped with 90-volt motors and 40-cell 300- to 330-amp-hr. batteries. Both "Philco" and "Exide-Ironclad" batteries are used at Harrisburg 43 and Harco 47 mines. Jefferson No. 20 uses "Exide-Ironclad" Type TLM 300-amp.hr. units and some are installed at Buckhorn along with Gould Type KSHD. Eighteen sets of 24cell 300-amp.hr. "Exide-Ironclad" bat-

teries are used at Blue Bird No. 6. The first three, installed in July, 1936, still are in regular service.

Concentric trailing cables are installed on practically all d.c. cutters and loaders in southern Illinois but several companies report that new purchases will be parallel-duplex—better chance for heat escape and less splicing skill required. Three-conductor cables for the 220-volt a.c. cutters and loaders are made up only in a round jacket. Valier cables are typical of the sizes in use: i.e., No. 4 for 35-hp. mining machines and loaders and No. 2 for 50-hp. equipment.

One-hundred-foot trailing cables are

used on the d.c. cutters, loaders and drills in the shuttle-car sections at Harrisburg No. 43 mine. This saving in initial length of cable, in time required to handle cable and in maintenance by less kinking is made possible by installing on the floor in every second room a 4/0 single Tirex feeder cable and a bare solid return wire of the same size. An Ohio Brass fused nip is used for connecting the semi-portable floor cable to the trolley. Where the machine trailing cable is to be nipped to the floor cable, the latter is terminated in a solid hook looped over an insulator near the top of



600-amp, sectionalizing breaker (left) and a knife switch (right) serving a shuttlecar section in Harrisburg No. 43 mine.



Shuttle-car haulage is increasing the use of storage batteries and changing the electrical set-up in the sections.

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# POWER AND ELECTRIFICATION

# Southern Illinois Strip Mines

coal-loading and other activities outside of tractor operation, utility drag and shovel work in some instances, haulage (see p. 112) and similar operations is the rule at the majority of the southern Illinois strip mines. The one exception among major producers employs a steam shovel and diesel dragline but uses electric power for drilling and operation of the preparation plant.

All companies on electric power purchase their requirements and operate full-scale mechanical-cleaning plants. Energy consumption ranges from around 6 kw.-hr. per ton to 9.9 kw.-hr. per ton at Fidelity No. 11, United Electric Coal Cos., where the overburden averages 57 ft. The Fidelity percentage breakdown is: overburden drills, 2; stripping, 69; coal-loading, 5; tipple, 4; washer, 12; liquid-oxygen plant, 7; miscellaneous uses, 1. Maximum 15-minute demand is 3.157 kw.

## **Power Factor Not Pressing**

Power factor is not a pressing problem because motor-generators on shovels and draglines include synchronous motors. Also, operations with liquid-oxygen plants benefit from the usual 200-hp. synchronous compressor motor. With the opening of a new pit requiring material lengthening of the main pole line and maximum possible utilization of conductor area, Streamline mine, Southwestern Illinois Coal Corporation, is considering capacitors for the preparation-plant load to improve an 0.86 power factor.

Voltages of 4,000 to 4,500 are used on the large stripper motors and most loading shovels. For auxiliary pit equipment, such as overburden drills and pumps, 440 volts is the accepted standard. Solid neutral conductors are carried over pole lines and through cables in the 4,000-volt (nominal) system at all except Streamline and the Delta mine, Delta Coal Mining Co.

At Delta, the power company has permitted a 10:1-ratio current transformer in the ground connection to the Y at the transformer substation. The coal company also has installed a Westinghouse Type CO relay tripping (at 2 amp. after 0.2 sec.) the power company's oil circuit breaker, and favors this system as giving minimum trouble and maximum

protection. Although the pole lines at Delta are without ground wires they are included in the trailing cables. At the "hot houses" near poles where these cables are fed, the cable ground wires are connected to ground rods driven to permanent moisture.

Three of the mines carrying solid ground wires have current transformers and instantaneous relays to open the feeder breakers if grounds occur. These are: Pyramid No. 1, Pyramid Coal Corporation; Bankston Creek No. 6, Bankston Creek Collieries Co., an affiliate of the Sahara Coal Co.; and Burning Star, Truax-Traer Coal Co. At Pyramid the breaker trips on a 15-amp. current; Bankston Creek No. 6, 10 amp.

Streamline, the second operation where a ground wire is not included in the pole line, is the only mine using a field-cable system instead of pole-line laterals. The local ground where the cable line begins is made by digging 7 or 8 ft. deep, placing a ball of scrap copper wire in the bottom of the hole, saturating the earth around it with calcium chloride and water and using a 10-ft. galvanized pipe as a riser. These grounds are tested once a month with a

Ground protection for Delta mine at the power company's substation. A is a current transformer in the neutral ground and B is a relay which trips the breaker with a ground current of 2 amp. for 0.2 second.

megger and are corrected if they exceed 2 ohms.

At Bankston Creek No. 6 (Bucyrus-Erie 950-B 30-yd. stripper and a 100-B 6-yd. loading shovel with General Electric equipment), the 4,000-volt line protection consists of 175-amp. fuses on the strip shovel, 200-amp. fuses in a portable switch house at the end of the pole line and a 400-amp. overload oil circuit breaker feeding the pole line. The stripper hoist is counterbalanced and the synchronous motor driving the motorgenerator is rated 1,000 hp., 0.9 power factor. The induction motor driving the loader m.g. set is rated at 190 hp.

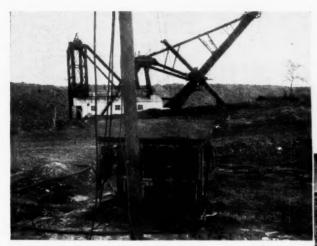
Largest electrical equipment in the field is on a Marion 5600 strip shovel at Fidelity No. 11 mine (1,700-kva. 0.8-power-factor generators). Although installed ten years, the shovel in many respects still is the largest in the country. It has been rebuilt and ballast added to accommodate a 26-cu.yd. dipper, instead of the original 15. Present weight is approximately 1,800 tons.

## **Power Use Varies**

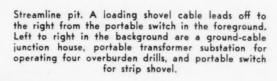
With a daily production of 6,000 tons (7,000 in winter) and a total demand of 3,157 kw., tons per kilowatt of demand at Fidelity is 1.90 to 2.22. This compares with 4.06 tons at Delta (675-kw. demand), where output is 2,750 tons per day. An overburden of 57 ft. at Fidelity, against 47 ft. at Delta, accounts for part of the difference, along with a smaller connected horsepower in the preparation plant, no liquid-oxygen plant, etc. However, the major saving (320 kw.) is made by operating a 10-yd. dragline during hours when the preparation plant is idle. The stripping shovel is a 12½-yd. unit.

The field-cable system at Streamline consists of four 1,000-ft. lengths of Okonite 4/0 wire-armored cables containing three ground wires. Cable sections are connected at portable wooden junction houses which contain cutouts and taps for three feeder circuits. At times, the feeds for stripper, loader and portable transformers for drills and pumps all hook in to one junction house.

On top the highwall and 100 ft. or so from the junction houses, switches on wooden sleds connect to the trailing cables on the strip and loading shovels.

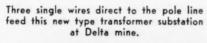


This transformer substation and switch house at the end of a lateral pole line at Bankston Creek No. 6 has connectors for two 4,000-volt trailing cables and five safety switches with connectors for 440-volt cables.





Streamline is the only southern Illinois mine using the field cable system. The wire-armored cable in the foreground leads to the portable junction house at the right.







Steel switch houses for stripper and dragline at Burning Star. The 1,023-ft. trailing cables are fed through overload oil switches in these houses.

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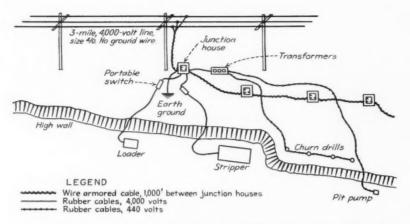


Fig. I—Schematic diagram of power circuits at Streamline, where field cables are used.

The 1,000-ft. stripper trailing cable is Simplex-Tirex, size 1/0, with three ground wires and no shielding. Feeding the loading shovel is a 1,000-ft. General Electric tellurium cable-size No. 6, shielded, having four ground wires. The center ground wire is bare and in contact with the shields of the three power conductors, thus draining off induced voltage in case a section of the shielding breaks electrical connection with the balance on that conductor. At Burning Star mine, a cable of the same 4-ground-wire and shielded construction, size 1/0, 1,023 ft. long, is in use on a Marion 10-yd. Model 360 dragline. However, most trailing cables in the district are without this shielding over individual conductors.

Pyramid is one of the few which connects the shovel trailing cable directly to the end of a lateral pole line. The protection is an oil switch in the pole line feeding the pit. At Fidelity No. 11, a 300-ft. length of rubber-insulated jute-covered cable connects the pole line to a switch sled. Then 500 ft. of rubber-jacketed cable leads on to a trailing-cable connector sled on top the highwall. At Bankston Creek No. 6 the stripper cable is 800 ft. long. A 500-ft. section of the same cable runs from a connector sled in the pit to a switch house at the pole line. To minimize delays, a second 500-ft. length is installed at the next lateral 1,000 ft. ahead ready for a quick transfer of the shovel trailing cable to the next connector sled. At Delta, 250- to 500-ft. lengths of cable are interposed between the pole line and the connector box at the beginning of the 1,000-ft. trailing cable. At Burning Star, the intermediate cable is 200 ft. long.

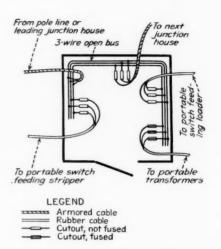


Fig. 2—Junction houses in the field cable system at Streamline mine. Cables contain ground wires (not shown) which are tied to an earth ground at the beginning of the cable system.

Steel is used for switch, connector and transformer sleds at Pyramid, Burning Star and Bankston Creek No. 6. At Delta, a new type of wooden-sled transformer substation has been adopted. It includes three 25-kva. 4,160/440-volt transformers for operating drills and pumps, and is intended for a position directly under the pole line. single wires separated by pin insulators on a sloping guard at one side of the sled connect directly to the line wires. Extra length in a drop wire is taken care of by first looping it over the line wire. Fused cutouts serve the high side and a 200-amp, safety switch with metal receptacle for a Miller plug serves the 440-volt cable to the pit equipment.



Portable steel transformer substations furnish 440 volts for drills and pumps at Pyramid mine.

# MAINTENANCE AND SUPPLIES

# Southern Illinois District

AINTENANCE departments at underground and strip mines now have much in common through the extensive use of flame torches and arcwelders. Both types of mines have made rapid progress toward more preventive maintenance and less repairing. Even warehouse and supply problems, closely tied to efficient maintenance, do not differ materially. And total inventories per ton of daily production at the deep mines of southern Illinois are about the same as at the strip mines.

The usual topworks set-up at deep mines provides for a chief electrician and a master mechanic, both reporting to the top foreman. Maintenance of underground equipment usually is in charge of a chief electrician reporting to the mine manager. Number of mines operated by one company in one locality and the experience route followed by certain mine officials to their positions are responsible for several variations.

## Superintendent for Top Work

An outside superintendent heads all top maintenance and top shop work, both mechanical and electrical, at the four Old Ben Coal Corporation mines. He also is consulted on underground maintenance, handled at each mine by a chief electrician reporting to the mine manager. The outside superintendent, a man of long mechanical and electrical experience, is assisted by a top foreman at each mine and two top electricians, one for the north group of mines and another for the south.

One maintenance engineer is employed by the Franklin County Coal Corporation to supervise mechanical and electrical maintenance at Energy No. 5 and Royalton No. 7 mines. He is assisted by a master mechanic and a chief electrician underground at each property. The Peabody Coal Co. employs a division chief electrician who is a consultant on electrical and mechanical maintenance for the several mines, each with one chief electrician for both bottom and top equipment.

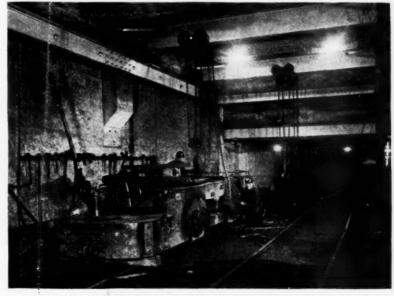
At Valier mine, Valier Coal Co., where the superintendent formerly headed the electrical department, underground maintenance is under two repair foremen, one for day work and the other for night. No salaried electrician is kept on top. Two men, a chief electrician and a shop foreman, handle top maintenance at New Orient mine, Chicago, Wilmington & Franklin Coal Co. Another maintenance foreman takes care of night work. The underground is divided between two men reporting to the mine manager. One, termed the chief electrician, handles all underground power distribution, electric coal drills, locomotives and signals. The other, a machine boss, looks after maintenance of cutters and loading machines.

Material and labor costs for maintaining loading machines runs 3c. to 8c. per ton at the larger mines where loader maintenance has been placed on a unit basis. Part assemblies, such as rear conveyors, clutches, pumps and gathering heads, are overhauled in a top shop and the underground work consists principally of replacing a worn or damaged loader unit with a rebuilt assembly.

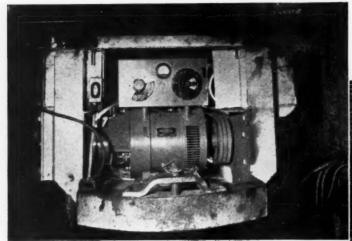
General overhauls of loading machines have, in most cases, simmered down to chassis overhauls only, because other parts are kept in new condition by unit replacement. In all cases the time for a general overhaul is determined by inspection of condition rather than on a tonnage or days-worked basis.

At New Orient, where Joy 5BU loaders are in use, the percentage of shift time lost due to repairs was 3.42 in 1939 compared with 5.2 in 1929 (Table I). Power interruptions caused an 0.29 per cent loss in 1939, compared to 0.40 per cent in 1929.

Most southern Illinois deep mines find it economical to keep a maintenance man on the section during working hours. Examples are: Royalton No. 7 and Energy No. 5, one man each section for one or several machines; Jefferson No. 20, Consolidated Coal Co., man in section at all times to maintain and lubricate; Harco No. 47, Peabody Coal Co., one man at each of four main partings; Majestic No. 14, Peabody, men work from a shop on each section; Harrisburg No. 43, Peabody, man on shuttle-car section to maintain three Joy loaders, three cutters, three drills, six shuttle cars and three car-loading elevators; Bankston Creek No. 5, Bankston Creek Collieries Co., an affiliate of the Sahara Coal Co., one repairman for four Joy loaders; Valier, repairman for each two loaders, who also repairs locomotives, cutting machines and drills, looks after sprinkler pipes and maintains trolley and a.c. power lines as time permits; Orient



In bottom shop in New Orient mine a 15-ton locomotive is being modernized by applying tapered roller bearings to the journals.



Welding and repair truck for underground maintenance work in Kathleen mine.

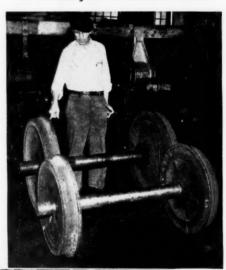
This compact welding truck with steel canopy and tool cabinet belongs underground in Harrisburg No. 43 but when photographed was in use temporarily in the top shop building loader heads.



In New Orient, piping from a high-pressure air gun serves for greasing three cars without moving them.



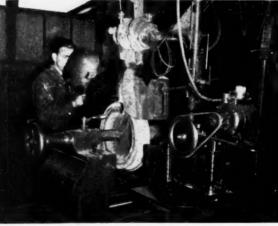
Flanges as well as the treads are built up by the Harrisburg No. 43 automatic welder.



Slow cooling is secured by wrapping the welded wheel in a rock-wool blanket at Harrisburg No. 43. At the right is the motor-driven peening hammer which has been turned to one side to make way for the blanket.



Wheels and tires for Peabody's southern Illinois mines are built up by automatic arc-weld in the top shop at Harrisburg No. 43.



mines, man on section (two to five machines) with extra help called from the bottom shop.

At most larger mines, loading machines are lubricated by maintenance crews at night rather than by the loader operators. At about half, the lubricating crew also inspects and repairs loaders. At Valier, the crew inspects and repairs only the fittings. A maintenance man at the face during the shift handles lubrication at the Old Ben mines.

Special pressure-pump lubricating trucks are used at Valier and New Orient. Valier has two of these trucks, each with two 110-gal. tanks, an interurban-type air compressor and an Alemite high-pressure gun. One tank holds hydraulic and the other lubricating oil. At New Orient, one crew with a pressure truck lubricates fourteen Joy machines a shift. Two crews with hand guns handle the rest.

Mine-car greasing is continuous at some mines and periodic at others. A New Orient crew, which maintains bottom tracks and replaces car wheels, also greases mine cars as fast as time permits. The greasing shop is at the end of the empty track beyond the point where cars gravitate back to the empty hole. An air-operated grease gun with the air cylinder rebuilt larger for extra pressure is connected by pipes to points on each side of the track for greasing three cars without moving.

# Cars Greased in Two Days

All cars at Zeigler No. 2 mine, Bell & Zoller Coal & Mining Co., recently were greased in two days on the empty bottom. A 20:1-ratio air gun forced grease through double-strength 14-in. pipe to 6ft. hose connections on each side of the track. Four men greasing and two men blocking and marking worked the first day, then two men greasing and the same number blocking the second day. Total grease and labor cost per car (Table II) was 46.7c. During 1939, when cars were greased singly, the labor cost per car for greasing, inspecting bearings and adjusting where necessary, inspecting hitchings and making minor miscellaneous repairs was 38.5c. This figure is an average for 465 Timken-equipped cars, and in this regular once-a-year check of the 1,860 bearings, 19 per cent needed adjustment. Since lubrication cost for all equipment has been reduced to a very small item, selection at this mine now is based on maintenance results entirely. For Joy loaders. as an example, a lubricant is selected



Every few days the chief electrician in Majestic No. 14 makes a personal inspection of all d.c. machinery.

which will operate at the lowest temperature in the oil pans.

With the advent of rubber-tired haulage, battery charging assumes greater importance in an underground maintenance set-up. Shuttle cars were in use in four of the southern Illinois mines surveyed, with tractor-trailer equipment in a fifth. Also, about one-fifth of the gathering locomotives serving loading machines were battery-powered. Locomotive batteries usually are charged on the main bottom and shuttle-car and tractor batteries on the section. At Harrisburg No. 43 mine, however, shuttlecar batteries are hauled to the bottom on eight special cars for charging. Better cleaning and charging is the principal reason for this practice. These 48cell 300- to 330-amp.hr. batteries, each consisting of two 24-cell trays, are charged from the 275-volt trolley through a 7½-hp. balancer set with sufficient capacity to handle one set off balance. As a guard against grounding, car wheels rest on insulating blocks and the cars are uncoupled while in the charging barn. Eight Exide Model MP charge controls with a.c. motor-driven timers and Hartman switches provide two-step charging through resistances.

Shuttle-car charging is done on the section at Jefferson No. 20. Turntable charging racks have been built to simplify handling from shuttle car to rack and vice versa. Two turntables, one on each side of the runway, accommodate

five trays each, equal to 2½ batteries. However, the normal loading is four trays. A d.c./d.c. 275/110-volt motor-generator supplies power. At Consolidated's New Monarch mine, seventeen battery locomotives (service and swing haulage) are charged in one barn on the main bottom. Proper voltage is secured by operating a balancer set on trolley power.

#### Table II—Mine Car Greasing Data, Zeigler No. 2 Mine

Total										628
Total	man-	hour	8 .		 0				0	87.5
Total										\$73.67
Total	greas	e, po	und	ls.						4,000
Total	cost	of g	reas	se.						\$220
Labor	cost	per	car							\$0.117
Greas										\$0.35
Total										
labo										\$0.467
Greas										6.37
Greas										1.57

Properties served by central shops include the four Old Ben mines with a central machine shop at No. 15 mine and a central electric shop at No. 11. "Units" for loading machines are rebuilt in the No. 15 shop. The Sahara Coal Co. operates a central shop for machine and electrical work for all the Sahara and Bankston Creek properties, including Bankston Creek Nos. 4 and 5 deep mines and No. 6 strip. Other companies operating more than one mine normally have separate shops for each property, except that, in a few instances, certain items of work are concentrated at one mine, such as locomotive tire and wheel welding for the Peabody mines, all done with an automatic machine at Harrisburg No. 43 mine.

A change from tires to steel wheels is under way or has been completed at Valier mine, at the four Peabody mines and the two Orient mines. Wheels or tires for several mines are welded by

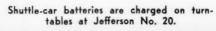
## Table I—Percentage Time Loss by Mechanical Loading Units, New Orient Mine

		•									
	1939	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929
Empties	0.03	0.13	0.30	0.48	0.28	0.20	0.46	0.34	0.27	0.85	1.40
Track	0.26	0.30	0.34	0.49	0.43	0.47	0.38	0.37	0.33	0.56	0.60
Repairs	3.42	3.41	3.00	3.27	3.79	4.65	5.22	4.44	3.90	5.18	5.20
Power Miscel-	0.29	0.14	0.13	0.55	0.38	0.23	0.14	0.37	0.33	0.20	0.40
laneous	0.49	0.53	0.59	0.55	0.47	0.45	0.56	0.41	0.59	0.97	2.10
Total	4.49*	4.51	4.36	5.25	5.35	6.00	6.76	5.93	5.42	7.76	9.70

<sup>\*</sup> Equal to 19 minutes per 7-hour shift.



Tires for Old Ben mines are built up by hand at No. 15 central machine shop using 1/4-in. rods with cross beads applied at an angle.





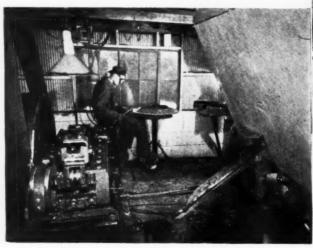
All of the winding is done for the three Consolidated Coal Co. mines in the New Monarch shop.



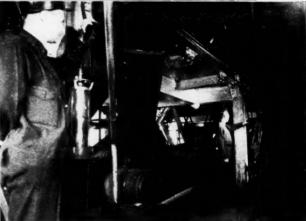
Rope stretch is taken up in 7 minutes on this cage at Royalton No. 7.



Part of bit rolling and tipping shop at Kathleen.



Like several others, the Pyramid preparation plant is piped and wired for gas torches and arc-welding. The man at the left exhibits one of the rubber connectors for a welding cable and the man at the right points to the valves of the acetylene and oxygen lines.



automatic machine at the Westinghouse service shop at St. Louis. This mine list includes Kathleen, Union Colliery Co.; Energy No. 5, Royalton No. 7, Orient No. 1 and New Orient.

Included in the automatic tire- and wheel-welding machine at Peabody's Harrisburg 43 mine is an automatic peening hammer (3-in. peen) which hits the newly deposited bead a heavy blow each a-in. of peripheral travel. Before welding, a wheel is preheated 12 hours with a gasoline torch. Immediately upon completion of welding the wheel is wrapped in a blanket of mineral wool between pieces of woven wire to retard cooling. Two-hundred to 300 tires and wheels are welded per year and in three years of machine operation only three tires have broken after completion. The Harrisburg 43 machine is equipped with two Westinghouse automatic heads. Filling material is 4-in. "Stoody Positive" wire. Machining after welding is done in a separate tire lathe with speed adjustment by friction drive and a d.c. motor with field rheostat control.

## Welding Rebuilds Wheels

Wheels are rebuilt in a combination welding and turning lathe with two General Electric automatic heads at Valier mine. Before welding, done with 3/16-in. rod, wheels are preheated to "spit-frying" temperature with kerosene torches.

Hand filling of tires or wheels is practiced by Old Ben Coal Corporation and the Consolidated Coal Co. Without preheating, Old Ben uses 4-in. Lincoln "Fleetweld" rod and the crossbead is placed at such an angle that one rod just completes one bead. Welded tires give 9 to 10 months' service compared to 11 to 11½ months from a new tire. Total cost of filling and turning is 50 per cent of the cost of new tires and the times a tire can be welded seems unlimited. Some have been welded five times.

Four southern Illinois companies covered in the maintenance survey do their own armature and motor winding. These are Old Ben, Consolidated, Valier and C. W. & F. Some winding is done at Peabody mines, with the balance by commercial shops.

Five companies are numbered among experimental and regular users of glass insulation. Beginning a year ago all rewinds of locomotive armatures for Kathleen mine have been made with "glass" glass-insulated coils. Twenty armatures are now in use in Zeigler No. l mine and glass has been adopted as a tentative standard for both Zeigler operations. Glass is used on shuttle-car armatures and a few drill armatures at Consolidated Coal Co. mines. At some Peabody mines experiments with glass are under way on a few locomotives and cutting machines. In Valier, about 20 per cent of the underground d.c. and a.c. motors are glass-insulated.

Asbestos-insulated coils are the Old Ben standard for electrical equipment liable to severe overheating. Asbestos-

covered wiring for d.c, equipment finds wide favor. Companies using Rockbestos wiring exclusively include Old Ben, Union Colliery, Consolidated and Peabody. Rockbestos cable is used at Zeigler No. 1 mine; at Zeigler No. 2, the standard is General Electric Glyptal-cloth cable.

Vulcanizing of trailing cables has been practiced some time by the Old Ben Coal Corporation. After six to ten temporary splices a 300-ft. cable is sent to the armature shop at No. 11 mine. Old Ben uses No. 2 duplex on slabbers and loaders and No. 3 single on locomotives. The No. 3 cable, however, is not vulcanized. Zeigler No. 1 recently began vulcanizing some mine cables. Some vulcanizing also is done at Orient No. 1 and the Peabody mines. At New Orient, however, vulcanizing is a regular practice and is done in an underground shop.

Southern Illinois includes a number of operations partly or completely on the throwaway-cutter-bit basis. Standard bits normally are hard-surfaced, either by the coal company or a bit-service organization. Companies doing their own include Old Ben, which has concentrated sharpening and Haystellite tipping for four mines in a shop at No. 8. Coal cut per bit has been increased 500 per cent and total bit cost is 0.29c, per ton. Formerly two bit sharpeners were employed at each mine. Companies obtaining tipped bits from the Cutter Bit Service Co. include Consolidated, Peabody and C. W. & F.; Auto Machine Co., Blue Bird Coal

#### Bits Tipped Each Time

Most companies regrind bits several times before resharpening and retipping. Valier, however, retips each time, on the ground that a better point, etc., increases square footage cut. At Kathleen, tipped bits are reground three times before resharpening. "Haystellite" is the tipping medium and tons cut per sharpening is four times the original. At Royalton No. 7, first in southern Illinois to tip bits (1929), using borium, five regrindings are not unusual.

Life of ropes at the southern Illinois deep mines studied by Coal Age ranges from 300,000 to 1,250,000 tons for skip hoists and 150,000 to 500,000 for cage hoists. Because cages normally are used for hoisting men as well as coal, ropes are likely to be taken out of service sooner than if auxiliary hoists were used. At every mine, time for taking off a rope is determined by inspection rather than by days of service or tonnage hoisted. In some cases, the criterion is number of broken wires showing in the whole rope; in others, number of breaks in a fixed distance; and still others, cessation of stretch even though no broken wires have appeared.

At Royalton No. 7 mine, where cars are hoisted out of a 320-ft. shaft by steam and total rope length is 675 ft., the 1\(\frac{1}{8}\)-in. ropes are removed when stretching ceases. Total stretch usually is about 50

in. When taken off, the number of broken wires (last weekly inspection) usually is fifteen. Rope life generally is 300,000 to 450,000 tons. The Royalton cage is equipped with a special 40-in. take-up whereby stretch can be taken up in 7 minutes, compared with 2 hours on the drum. In this take-up the thimble is moved to different positions between vertical straps drilled with a series of equally spaced holes for the thimble cross bolts.

Maintenance problems are the same in preparation plants at both strip and underground mines and the two most important tools are the cutting torch and arc-welder. Five large preparation plants in southern Illinois pipe acetylene throughout the building and six have installed low-voltage welding circuits. Plants with oxygen and acetylene lines and permanent welding cables include New Monarch, Bankston Creek and Pyramid, Pyramid Coal Corporation. Piping systems at Jefferson No. 20 deep mine and Fidelity No. 11 strip mine, United Electric Coal Cos., handle acetylene only-in both cases generated at the mine. Oxygen is taken in as needed in bottles. Bankston Creek purchases acetylene in the regular bottles rather than generate it locally.

Number of men required to maintain the larger preparation plants varies widely. The newest plants with ball-bearing motors, ball- or roller-bearing shafting, dustproof starters and abrasion-resisting steels get along with three or four men

Handling ties, timber and other supplies at Valier mine was completely mechanized ten years ago.





The orderliness of this perpetual-inventory supply house at Harco No. 47 is characteristic of Peabody supply bases.

In the shanties of section bosses and repairmen in Valier mine a few loader parts are kept on hand.



Building up and plating rotary drill bits which contain ball bearings at Pyramid. Most of the bit is immersed in water.



Grooves at the right ends of each drum are smaller than those on the left three-quarters. Change from uniform grooves to this construction increased the life of counterbalance ropes on the stripper at Bankston Creek No. 6.

Darker cable at the left has served ten years in stripper trailing and extension work at Fidelity and is to be scrapped. The cable at the right has been unloaded at the shop ready for its yearly vulcanizing.





This battery truck moves supplies in the Buckhorn conveyor section.

for lubrication and maintenance. Other older plants with different equipment require as many as 25 men.

Central supply houses for groups of mines have practically passed out in southern Illinois. Even Bell & Zoller, with its two Zeigler mines only two miles apart, recently abandoned a central supply house at No. 2 in favor of houses at each mine. The Sahara Coal Co., with a central house and shop serving, among other properties, Bankston Creek Nos. 4 and 5 deep mines and No. 6 strip mine, is the lone remaining example of the central system.

Contrary to what might be expected, total inventory for the two Zeigler mines is now less than with a central supply house, yet there are fewer waits for material or parts as a result of closer cooperation between maintenance departments and storekeepers. Each supply house uses the perpetual-inventory system with "Shif-Dex" visible record binders.

Every large deep mine in the district employs a warehouse clerk or storekeeper and keeps a perpetual inventory. This, however, is not true of all strip mines. At Delta (Delta Coal Mining Co.), for instance, materials are charged out when received, thus ending clerical work. On the other hand, Burning Star strip mine, Truax-Traer Coal Co., shipping 4,000 tons of washed coal per day, maintains a perpetual inventory numbering 3,500 items. Each day the clerk renders to the superintendent a report showing quantities and costs of all items charged to operation. In comparison, Orient No. 1 deep mine, 5,400 tons per day, carries 5,000 items on the perpetual inventory.

# Inventories Run the Same

Total inventories per ton of coal shipped appear to be nearly the same at strip and deep mines. At deep mines the average was \$11 of total inventory per ton and the range was \$6.65 to \$19.

At Kathleen mine, a fully electrified shaft operation shipping 5,300 tons per day, storehouse clerical work is handled by the general storekeeper and an assistant. The office and storage space for small items is a room 50x100 ft. which contains 1,800 bins. Other space, not including a timber treating and storage yard, consists of an annex to the main room, a long material shed and a loading platform. For convenience in accounting and to show supply use, 12 stock account numbers are used for receipts and issues, 45 account numbers

	W.	AREHOUSE DAILY RECORD	
REG. NO.	MATERIAL	QUANTITY UNIT COST AMOUNT	ACCOUNT
	TO SUPPLY CLERK, Please issue to  QUANTITY	RUAX - TRAER COAL COMPANY NO WAREHOUSE REQUISITION Date following material to be used for DESCRIPTION	4501
		W.S.CRIPTION	F
	NOTE - Paris		
	NOTE — Party receiving this material must sign receipt on back of this form	Supt. Foreman Operator	Electrician

Dispensing and daily reporting forms used in the supply house at Burning Star.

for charging out operating supplies and 48 for maintenance supplies. The aim at Kathleen is to keep on hand one month's materials and supplies. Physical inventories are made twice a year. To meet the demands of routine repair work underground, a number of items (all charged out) are kept in the main underground shop, and a few items, not over 40, in cabinets in the loading-machine sections.

One man, with occasional help, handles the accounting of supply-house stock at the 7,500-ton Valier mine. Here, 25 stock accounts are maintained for receipt and issue, and the items are charged out to ten operating accounts. A few Joy and other parts are kept in each section underground. Ties and timber are handled with a special clamshell-type timber bucket on a 6-ton gasoline crane mounted on a White motor truck. Twenty to 30 ties per grab is the usual rate for unloading a railroad car. The crane was installed in 1928 as the initial move in completely mechanizing materials handling. A magnet is substituted for moving rails and many other steel supplies. A plain clamshell is used for unloading sand.

Maintenance of excavators is a major problem at strip mines, especially where shovels and draglines are over five years old and handle much hard rock, General overhauls requiring three to six months have given away to continuous maintenance of minor items, exchange of units, and periodic overhauls of major parts such as booms and cats. Use of flanged and special high-tensile steels for structural parts and manganese steel for parts subject to severe wear and strain have materially lengthened service and reduced delays.

#### Idle Time 2.7 Hours

At Burning Star (60 ft. average cover and 40 ft. of hard material, including 6 ft. of limestone), non-digging time for the 17-yd. shovel averaged 2.7 hours per shift (8 hours) in the first half of 1940, compared with 2.4 hours in 1938 and 3.3 hours in 1937. These figures include moving shovel and trailing cable and shovel and cable repairs. The hard digging causes serious boom trouble every two or three years. Five years ago, when the shovel was about five years old, it was partially overhauled during a 30-day shutdown. All parts known to require renewal were obtained in advance and the work was pushed 24 hours per day. Less than three years ago, the boom was overhauled at a cost of \$11,000.

Fidelity No. 11 mine operates with equipment mostly ten years or more old and moves cover averaging 57 ft. Great stress is laid on preventive inspection and early repairing. Equipment consists of one 26-yd. shovel weighing 1,800 tons, two 15-yd. 5480 shovels, one 14-yd. 5480 dragline and three 42-yd. coal-loading shovels. The 5600 unit was rebuilt to increase bucket size from 15-yd. Dippers on 5480's were raised from 12-yd. and dragline buckets from 10. Original dippers on the loaders were 3-vd. As far as possible, major jobs on the large excavators are done in the summer when demand is less pressing, more daylight is available and the weather is better. New or rebuilt parts that fail at regular

## Table III—Yardage and Rope Life, Fidelity No. 11 Mine

Machine	Ropes Used	Diameter, Inches	Yardage Moved per Rope	Rope Cost per 1,900 Cu. Yd.
5600 shovel	5 hoist ropes	21/8	*00,000	\$1.45*
5480 shovel	5 hoist ropes	2	572,548	1.28
5480 shovel	6 hoist ropes	2	469,627	1.53
5480 dragline	14 hoist ropes 17 drag cables	$\frac{1}{2}\frac{1}{14}$	$508,863 \\ 330,708$	$\frac{0.96}{1.47}$
C - Marine Committee Commi				

 $<sup>^{\</sup>circ}$  Before the 5600 was rebuilt from a 15-yd, bucket to a 26-yd., the rope life was 565,964 cu. yd., and the cost \$2.06 per 1,000 cu. yd.

intervals always are kept on hand. These include dipper handles, crawler castings and treads, gears and pinions and a

complete set of cables.

Operators are responsible for detecting breaks in the early stages and, under supervision of the master mechanic, do their own repairing as far as possible. As a rule, the booms of the large excavators are lowered and overhauled every two years. Dipper handles, however, get that treatment once a year and thus have their life prolonged to five years. Point sheaves, now of manganese steel, greatly exceed the life of three years for the plain type formerly used.

When, because of worn rope grooves, repairs to the cast drum of the 26-yd. shovel at Fidelity became necessary, a week's time and considerable money was saved by machining the old drum in place and adding a steel lagging made up and grooved at the factory. The job took four days of 24 hours each. Since then, drums on the 5480 excavators have been given the same treatment. Trailing cables are used six or seven years and then serve two or three years more as

extension cables next to pole lines. Once a year, cables are taken to the electric shop and all temporary splices are done over and vulcanized. Not all the strip mines vulcanize cables but Delta also gives cables a yearly going over, using a vulcanizer circulating among the Sinclair properties.

Wire-rope renewals continue as an item of considerable cost. Table III sets forth life and cost data for a year on

certain ropes at Fidelity mine.

On a 32-yd, 950-B stripper at Bankston Creek No. 6 reducing fleet angle was suggested by an operator and has increased the life of 13-in, counterbalance ropes. Originally, these worked in the same grooves as the 21-in, hoist ropes. New drums with two sizes of grooving were applied. The 28-in. grooving is carried only far enough to accommodate the larger rope, with 13-in. from there to the end. The 13-in. rope, after filling the small grooves, rides over a flat space and finishes winding in the large grooves. Because considerable winding is in the small grooves these counterbalance ropes do not carry over nearly so far.

Special welding rods and hard-surfacing materials find many applications at strip mines, including repairing the Hughes bits used with new Sullivan rotary drills at Pyramid mines. These bits contain ball bearings which cannot be removed and must not be overheated. The whole bit, with the exception of the particular row of teeth being worked on, is immersed in water. With a gas torch and Oxweld No. 1 "High-Test" rod, the tooth point is built up and then plated with "Haystellite."

Stainless-steel rods are widely used for welding manganese parts. At Fidelity, where two welders work days and two nights, Lincoln "Stainweld A" rods are used for cracks in the cast manganese-steel lips of buckets. Latch-bar corners are built up with alternate layers of "Stainweld A" and "Wearweld"; bits for sidewall augers with a high-carbon rod surfaced with "Haystellite" 3/16-in. composite rod No. 63; and teeth for the 14-yd. dragline bucket with Lincoln "ManganWeld." Clevises and chains for the dragline are repaired with "Stain-

weld A."

# COAL PREPARATION

# Southern Illinois Field

REPARATION improvements in southern Illinois make it one of the foremost regions of the country in mechanical cleaning. The region also is a leader in preparation of the intermediate and smaller sizes, especially stoker, by crushing, rescreening, dedusting and removal of tramp iron. Several companies maintain complete processing plants solely for these sizes. Practically all operations are equipped to dustproof most or all the grades they produce, with many trademarking by cardboard disks or squares and dye or lacquer.

Some 23 of the 31 deep and strip mines covered in the Coal Age survey are served wholly or in part by mechanical-cleaning equipment. Six of these 23 can or do ship part or all their product to central preparation plants. A mechanical plant is being constructed at a 24th property, while a 25th employs a full-scale washing installation for pickings. Drying equipment includes both heat and centrifugal units.

Except that mechanical cleaning is not included, other southern Illinois plants adhere to the same standards and use

substantially the same equipment. Thus, the majority are prepared to crush, rescreen and dedust to make stoker and other small sizes, ship combinations, remove tramp iron and dustproof in line with all present-day preparation standards. One plant includes a new addition for reducing the entire output to minus  $\bar{\gamma}_{0}$  and dedusting it at 10-mesh. Another specializes in dedusting at 10- and 48-mesh.

Product usage and opportunities for mechanical preparation elsewhere have materially simplified preparation at several operations. With its output going to the parent railroad, Valier mine, Valier Coal Co., operates a simple four-track tipple with two picking table-loading booms. And Harrisburg No. 43 mine, Peabody Coal Co., customarily ships only some 6-in. lump and 1½-in. screenings from the No. 5 seam, sending its other coal to the Harco No. 47 mechanical plant.

Energy No. 5 mine, Franklin County Coal Corporation, is another which can send a part of its output to a mechanicalcleaning plant at Royalton No. 7 mine. Like most southern Illinois properties, the Energy No. 5 plant includes a main tipple and a rescreener. Coal ordinarily is sized into 6-in. lump, 6x3-in. furnace, 3x2-in. No. 1 nut and a minus 2-in. resultant in the main tipple. The three larger sizes are hand-picked (mercury-vapor lighting) and loaded separately or included in combinations.

Minus 2-in. goes over a Dings magnetic pulley into the rescreener for separation into 2x12- and minus 12-in. sizes. The former is hand-picked. The latter is rescreened and dedusted at approximately 10-mesh on "Gyrex" double-deck vibrators with stainless-steel cloth. Sizes are nominally 12x3-in. chestnut and 3-in. x10-mesh stoker. Combinations at Energy No. 5 are made on a mixing conveyor which also takes coal to an Ottumwa scraper-line box-car loader. All sizes may be dustproofed, using Viking equipment. Franklin County, incidentally, was the first to install hot-oil spraying at a coal mine.

McLaren strip mine, McLaren Coal Co., is served by a Link-Belt-equipped tipple designed and erected by the coal company. With four booms and six loading tracks, primary sizes normally are 7-in. lump, 7x4-in. furnace, 4x2-in. egg, 2x11- and 11x1-in. nut, 1-in.x10-mesh stoker and 10-mesh dust. All sizes to and including 2x14 are picked both on tables in the tipple and at the end of Link-Belt rescreening-type booms, paralleled by conveyors to return pickings to the refuse conveyor. Degradation taken out on the booms goes back to the screenings. Screenings are dedusted and stoker produced on a 4x10-ft. "Selectro" vibrating screen. A crusher is to be installed to break down 2x11 to increase stoker output. All sizes may be dustproofed by the 'Dustlix" process, using a 100-second treating fluid. Sprays are set to deliver an average of 1 gal. per ton.

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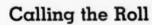
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With the assistance of a new rescreener, the Freeman Spur plant, Seymour Coal Mining Co., is equipped to produce 6-in. lump, 6x3-in. egg and 3x2-in. nut in the main tipple, with the following in the rescreener: 2x\frac{3}{4}, 1\frac{1}{2}x\frac{3}{4}, 2\frac{1}{2}x\frac{3}{4}, 2\frac{1}{2}x\frac{3}{4},



Preparation plants shown on the front cover of this issue of Coal Age are operated by these southern Illinois companies:

- 1-McLaren Coal Co.
- 2—Franklin County Coal Corporation (Royalton No. 7).
- 3-Union Colliery Co.
- 4—Old Ben Coal Corporation (Old Ben No. 15).
- 5—Bell & Zoller Coal & Mining Co.
- 6—Bankston Creek Collieries Co., an affiliate of the Sahara Coal Co.
- 7—Chicago, Wilmington & Franklin Coal Co. (New Orient).
- 8-Blue Bird Coal Co.
- 9—Peabody Coal Co. (Harco No. 47).
- 10-Pyramid Coal Corporation.
- 11—Consolidated Coal Co. (Jefferson No. 20).
- 12-Seymour Coal Mining Co.
- 13—Southwestern Illinois Coal Corporation.
- 14—United Electric Coal Cos. (Fidelity No. 11).
- 15—Truax-Traer Coal Co. (Burning Star).
- 16-Delta Coal Mining Co.



Trademarking stoker at Old Ben No. 14 "Processing Plant" by feeding into it a small percentage of coal coated with a green lacquer.

over a Stearns magnetic pulley to take out tramp iron. Rescreening and dedusting are done on Jeffrey-Traylor and "Selectro" vibrating equipment. Traylor screens are fitted with Jeffrey piano-wire cloth.

Other equipment at Freeman Spur includes three picking table-loading booms for coarse sizes, a Jeffrey single-roll Type N stoker-coal crusher preceded by a chute-type magnet and a Viking system for dustproofing all sizes with Standard 350-second spray oil. Average oil consumption, all sizes, is 1 gal. per ton. A "Flex-tooth" crusher will be installed to break down nut to increase stoker output.

#### **Dedust Stoker and Screenings**

The New Monarch preparation plant, Consolidated Coal Co., includes facilities for dedusting screenings and stoker at approximately 1-in. A Link-Belt doubleroll crusher breaks down pickings. Sizes made in the plant serving the company's new Buckhorn mine include: 6-in. lump, 6x3-in. furnace, 3x2-, 2x12- and 12x3-in. nut, and 2-, 12- or 4-in. screenings, either raw or dedusted at approximately & in. on Link-Belt and Symons horizontal vibrating screens. Equipment for producing additional intermediate sizes from screenings is scheduled for installation. Sizes picked at Buckhorn include 2x12. Tramp iron is removed from stoker and other small sizes by a Dings magnetic pulley. An American Pulverizer Co. ring mill can reduce any coarse size to as low as minus 3-in. Both Buckborn and New Monarch dustproof all sizes with Shell "Duosol."

With the reopening of Nason mine, now Jefferson No. 20, Consolidated added two loading tracks, installed a mixing conveyor and crusher for making combinations or breaking all coarse coal to 2 in., and erected a complete fine-

coal plant (Robins design) for screening, dedusting, distributing and mixing, supplemented by crushing equipment for breaking  $2x_0^{5}$ -in. coal to minus  $\frac{7}{16}$ -in. for loading or recirculation and dedusting (Coal Age, May, 1940, p. 44). Thus, with one crusher taking the coal down to 2-in. and routing it to another, the entire output may be reduced to minus  $\frac{7}{16}$ -in. A Dings magnetic pulley removes tramp iron from minus 2-in. coal. All sizes may be dustproofed with "Duosol." A four-bin 400-ton truck-loading plant supplements the main plant.

## Magnetic Pulley Installed

The 6-in. lump, 6x3-in. egg and 3x2-in. nut are picked on picking table-loading booms with Westinghouse combination fixtures (mercury-vapor and incandescent lamps). Bony pickings are crushed for boiler fuel. Picked lump, egg and nut may be loaded separately, used in various combinations up to and including mine-run or crushed to minus 2-in. for loading or supplementary rescreening and dedusting. Minus 2-in. natural screenings, plus minus 2-in. crushed coal and degradation, after passing over the magnetic pulley, go to "Gyrex" screens for separation into  $2x1\frac{1}{2}$ ,  $1\frac{1}{2}x\frac{3}{4}$ ,  $3x\frac{7}{16}$  and minus  $\frac{7}{16}$  in. fractions. The latter goes to Tyler 400 electric screens for dedusting at 10-mesh.

Dust may be recombined in any desired proportion, sent to the boiler plant or loaded on a separate track. Other sizes fall onto assembly belts discharging into a nest of proportioning gates making two sizes, one strictly proportioned as to the various fractions and the other representing the resultant. Or part or all of one size may be loaded on one of two tracks, all sizes may be loaded on one track or split between two, etc., in an infinite variety of combinations. Or any or all sizes larger than  $\frac{\pi}{16}$  may be

bypassed to a Robins stoker-coal crusher for reduction to minus  $\frac{5}{18}$  and recirculation for dedusting.

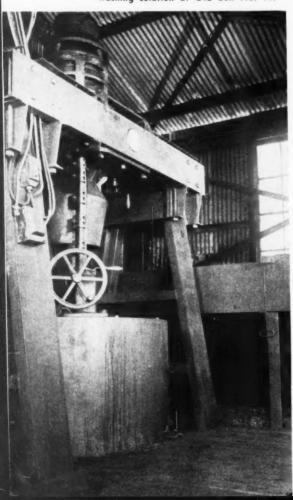
Dedusted screenings and dedusted stoker coals are made in a company-designed rescreening and dedusting plant (shaker and vibrating screens and aspirating-type dedusters) at New Orient mine, Chicago, Wilmington & Franklin Coal Co. Mine-run is dumped into the main tipple where 6-in. lump, 6x3-in. furnace and 3x2-in. egg are hand-picked and boom-loaded. Pickings are crushed and washed. The washer enables pickers really to clean the coal with the knowledge that any values in suspicious material will be later salvaged.

Minus 2-in. for the production of dedusted screenings and stoker coals are conveyed to the rescreener and discharged onto "Hum-mer" electric screens for separation into 2xl- and minus 1-in. sizes. The 2xl-in. fraction then goes to shaking screens for separation into 2xl2-in. stove and 1½xl-in. chestnut (undersize recirculated to the primary "Hum-mers"). Minus 1-in. coal is discharged onto addi-

culated to the primary "Hum-mers". Minus 1-in. coal is discharged onto additional "Hum-mer" screens for separation into  $1x\frac{1}{16}$ -in. pea and  $\frac{5}{16}x0$ -in. carbon, each to a separate bin. The four sizes then may be loaded separately—stove and chestnut by means of loading booms and pea and carbon through chutes. Or two, three or four of the sizes may be reassembled and loaded.

As all the bins are fitted with star gates or "Hum-mer" feeders, size proportions in a combination may be closely

This centrifugal separator, plus gravity settling boxes, was installed to clean chloride washing solution at Old Ben No. 11.



controlled. In addition, any or all sizes over  $\hat{r}_{5}^{c}$ -in. may be run to crushing equipment (Pennsylvania "Granulator" and American ring mill) for reduction to nominally minus  $\hat{r}_{5}^{c}$  and recirculation to the primary vibrators by a Redler elevator. A Redler conveyor and bucket elevator also return stove, chestnut and pea degradation to the primary screens.

In dedusting, minus fö-in. carbon is transported in a Redler conveyor-elevator to a Koppers Birtley-type aspirator which takes out minus 48-mesh dust. The partly dedusted coal then falls onto a "Hummer" screen for separation into fö-in.x 10-mesh and minus 10-mesh sizes. Each size is fed to a secondary aspirator for removal of the remaining 48-mesh dust, which is collected in cyclones and stored in a dust bin. Finally, dust in the cyclone discharge is collected in a bag house.

#### Sizes Stored and Remixed

The 10x48-mesh coal from the secondary aspirator goes into a Redler conveyor-elevator for storage in a separate bin, while the 15-in.x10-mesh size (dedusted 10-mesh stoker) is discharged onto a conveyor. To make dedusted 48-mesh stoker, 10x48-mesh from the storage bin is conveyed to the loading point by a reassembly conveyor. The larger sizes also may be brought to this loading point to make 2-, 12- or 4-in. screenings dedusted at 10- or 48-mesh. Also, minus 48-mesh dust may be added to make reassembled straight screenings. The New Orient preparation plant is equipped with a United States-Hoffman vacuum system for clean-up work.

Pickings from the main plant are stored in bins, from which they are fed to the washer belt by two Jeffrey-Traylor vibrating feeders. The belt discharges into an American S-38 ring mill, which reduces pickings to nominally minus 12in. From a surge bin the crushed pickings are elevated (Redler equipment) to a Robins "Gyrex" screen which removes minus 10-mesh material. material goes to the refuse, while the rest of the pickings is chuted to a Jeffrey Baum-type air-operated jig. Material from both the primary and secondary elevators is rejected. The washed coal flows onto fixed sieves which reduce the surface moisture to approximately 12 to 15 per cent and then onto two sidedrive horizontal "Selectro" vibrators for final dewatering at 10-mesh to a surface moisture of 4 to 5 per cent.

A new cleaning plant designed by Allen & Garcia and incorporating Jeffrey Baumtype jig equipment for  $6x_{16}^{-7}$ -in. coal and Stump "Air-Flow" cleaners for minus  $_{16}^{-7}$ -in. was being built at Orient No. 1 mine at the time of the Coal Age survey. Sufficient original tipple equipment is being retained to permit picking and loading 6-in. lump; also, the original dedusting plant for dedusting minus  $_{16}^{-7}$ -in. after air cleaning.

Operation of the Orient No. 1 dedusting plant is similar to that at New Orient. Minus 48-mesh coal, if no other

outlet is available, is used under the power-plant boilers. Washed sizes will be 6x3, 3x2, 2x1½, 1½x¾ and ¾x√3. Mixing equipment will permit any desired combination of the picked, washed and air-cleaned sizes.

While some mechanical cleaners in southern Illinois prepare only one or two sizes, most installations, as at Orient No. 1, handle a complete range. In some cases, the maximum size is 2-in.; in others, 3. Most plants, however, go up to 6-in. and some to 7, using washers or washers and air cleaners in combination. Many full-scale plants are distinguished, among other things, by provisions for reducing the size of lumps in the minerun feed and facilities for re-treating pickings and part of the mechanical-cleaner reject to increase recovery.

Several operations include provisions for dedusting coal before washing. Peabody and Franklin County also dump part of a day's run of coal into railroad cars for preparation on the second shift. Rescreeners and bins for small washed coal, in some cases with proportioning feeders, are installed by several companies. Special provisions, including crushing and screening equipment, are operated by most companies for stoker-coal production. Several have supplemented washers with centrifugal or heat dryers.

#### Mechanical Cleaners Installed

Chloride washers are installed at all four mines of the Old Ben Coal Corporation for cleaning 6x3- and 3x2- or 3x 1½-in. sizes. In addition, American pneumatic separators assist in preparing the company's special stoker coal at the No. 14 "Processing Plant." Some Old Ben rescreening plants (all mines) operate on washed coal.

The usual Old Ben size list is plus 6-in., 6x3-, 3x2-, 2x1\frac{1}{2}-, 1\frac{1}{2}x\frac{3}{4}-, \frac{3}{4}x\frac{7}{16}- and minus \frac{7}{16}-in., plus \frac{7}{16}-in.x10-mesh, minus 10-mesh and the special stoker sizes. One 12-ft. 150-tons-per-hour chloride washer handles 6x3-in. coal at No. 8; two each at Nos. 11 and 15 handle 6x3 and 3x1\frac{1}{2}: and two at No. 14 handle 6x3 and 3x2. Installation of these washers was prompted, in addition to efficiency considerations, by simplicity, ease of installation in existing plants and low cost. All sizes cleaned in calcium-chloride washers are submitted to a rinsing spray after washing.

Chloride-washer installation has been accompanied by development of methods for keeping the fine-coal content of the washing medium down to acceptable limits. The methods are settlement in tanks and continuous circulation to a centrifugal separator. Chloride is purchased in insulated tank cars at a specific gravity of 1.50 and is diluted on receipt to 1.30 (1.350 in winter) to prevent crystallization. The final cut to the washing gravity of 1.210 to 1.290 is made when make-up chloride is added to the washer baths. Make-up is continuous.

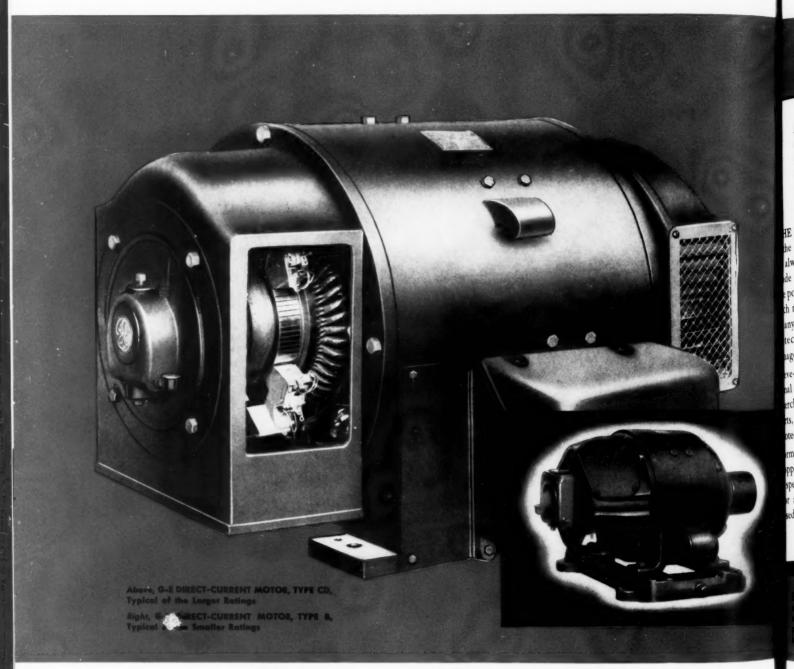
(Turn to page 141)



VENTILATION

MODIFICATIONS

# The "Father of Them All"







One-piece, cast-iron brush-holder yoke is integral with brush rigging and forms part of the end shield. Boxes are cast-brass, V-type, for stable operation in both directions of rotation. Stainless-steel brush-holder springs provide adjustable tension.





Bearing housing for both ball and sleeve bearings can be used in the same bearing brackets. On motors for direct connection, bearings have babbitted shoulder at end of bearing to take armature thrust.



Commutator-end bearing bracket is a new design in the open motors. It gives protection and rigid bearing support. Machined rabbet fit of both bearing housing and frame assures concentricity of bearing alignment. Main field pole pieces are laminated ailicon steel, welded, and securely bolted to rolled-steel frame. Formex wire is used in all field coils. Additional insulation protects its dielectric strength, and red Chyptal varnish gives protection to coils.

Highly efficient fan scrott for reseated from the drive-end fractations or removal. Buffle is a curally for proper air flow. Vo. in 18

# "Still Leads the Parade

Industry has been using direct-current motors in many key production jobs ever since it was discovered, about 1873, that a dynamo supplied with direct current would operate as a motor. The General Electric Company, through one of its predecessors, manufactured and placed on the market the first commercial d-c machine, in 1876. Since then, General Electric has kept industry supplied with d-c motors improved with the most up-to-date features and newest developments for better protection and performance.

ENEW G-E direct-current motors incorporate he same care, engineering, and precision that always characterized G-E apparatus. The features de such improvements as compact assembly; positive ventilation; lower WR2; small diameter, means low headroom; reversal without changmy parts of the frame, fan, or brush rigging; and tection of exposed parts against external

ne and ball-bearing motors have the same exal dimensions, and motors of the same rating are schangeable. Current-carrying parts and rotating ts, except shaft extensions, are enclosed for the nection of operators.

m-wound, Formex wire coils in the armatures, and pper-strip coils in the field poles, are treated with specially developed Glyptal base insulating varnish added protection to other insulating materials

Other features are rolled-steel frames, cast-aluminum fans specially designed for reversing service, V-type brush holders, cast-brass brush-holder boxes, accurately centered rabbet fit of bearing housing to end shield and end shield to frame, extra-large conduit box, provision for lubrication and flushing of bearings while motor is running, punched commutator segments, Textolite wedges in commutator slots for winding protection, and such accurate machining and stability that air-gap is constant.

You'll want to know more about these outstanding

features of the ultra-modern G-E d-c motors. Our local office has this information for you. General Electric, Schenectady, New York.

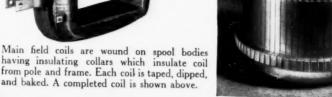




Main field coils are wound on spool bodies having insulating collars which insulate coil



Copper and mica segments of the new commutator are drawn together under high pressure while commutator



**ELECTRIC** 

### Think of PROTECTION

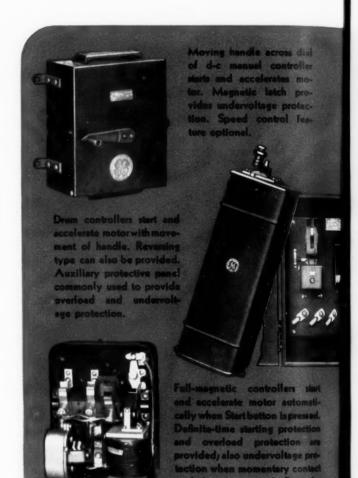
### When You Select Control for D-c Motors

ROTECTION is one of the most important duties of a d-c motor starter. Not only must it start and stop a motor, and perhaps adjust its speed, but it must protect the motor during starting, overload, and undervoltage, as well.

That's why selecting control that is right not only in its method of operation but in the protection it affords is vitally important to the success or failure of a d-c drive.

The complete line of G-E control for d-c motors enables you to select the right starter and provide the right protection for any job. Representatives of the standard lines are shown at the right. Special problems involving variablevoltage or electron-tube circuits for speed control can easily be solved by G-E controls tailored for their tasks.

For complete information on the many types of G-E control, and suggestions on their application, may we send you a copy of our booklet, "How to Select D-c Motor Control," soon to be off the press? Simply send your name and address—we will see that you receive one of the first copies. General Electric Company, Schenectady, N. Y.



### STARTING PROTECTION

D-c motors must be protected from severe current and torque surges in starting by series resistance, which is cut out as motor accelerates. Magnetic starters protect motor against too-rapid reduction of this resistance by definite-time acceleration.

### OVERLOAD PROTECTION

Slight overloads over a long period of time, or very severe overloads, may cause any motor winding to become dangerously overheated. Isothermic overload relay, when provided on d-c control, shuts motor down before windings can become seriously overheated.

### UNDERVOLTAGE PROTECTION

In case of a voltage failure, motor normally stops. Undervoltage protection disconnects motor until operator restarts it, preventing danger of full voltage being applied directly to stalled motor, or of operator being injured by unexpected restarting while he is inspecting machine.

The centrifugal solution cleaner went into operation at No. 11 mine in February, 1938, and reduced solids in suspension in the washer approximately 64 per cent. In operation, chloride solution is bled out of the washer continuously by means of an orifice protected by a screen diameter orifice and a head of  $7\frac{1}{2}$  in., solution draw-off is 25.68 g.p.m. higher the orifice can be placed, the better, as the hole can be enlarged with less chance of blocking. The orifice also tends to iron out fluctuations in solution level, inasmuch as draw-off decreases when the level drops, while the input remains the same, thus rebuilding the level.

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Solution bled out of the washer flows to a partitioned settling box with a gate to permit one or both sides to be used. When settlement results in a thickenough layer on one side it is closed off and the solids are shoveled out. The settling box accounts for about 40 per cent of the total clarification, the partly clarified solution flowing to a in. DeLaval centrifugal separator, which is stopped three or four times a shift and cleaned out. Clarified solution from the centrifuge goes into a sump from which it is pumped to sprays on the dewatering elevator on the washer. A 3,600-gal. tank also is on hand to permit drawing off the entire contents of a washer for cleaning

At Old Ben No. 15, solution is cleaned in a ten-cell tank, each cell holding 3,600 gal. One supplies the washer while the others are used for settling fines and solution draw-off. Greater personal judgment is required with tank, and clarification efficiency is reduced if settlement is shortened.

#### Small Coal to Rescreener

Hand-picking is used to clean 6-in. lump at Old Ben mines. Sizes smaller than 3-in. at No. 8 are sent to a rescreening plant which includes storage bins and reassembly conveyors. Ash-board rescreener shakers separate the 3x0 into  $3x^2$ ,  $2x^{\frac{1}{2}}$ ,  $1\frac{1}{2}x^{\frac{1}{2}}$ ,  $1x^{\frac{3}{4}}$ ,  $\frac{3}{4}x^{\frac{5}{16}}$  and  $\frac{5}{16}x^{\frac{5}{4}}$ . The latter then may be run to one "Selectro" and two Symons horizontal vibrators for dedusting at 10-mesh. A Link-Belt double-roll crusher is installed for breaking lump to screenings, with a Jeffrey single-roll machine in the rescreener to reduce 3x12-in. to minus 3-in. for blending with the regular run in making stoker.

Ash-board screens also are employed in the No. 11 rescreener to make  $1\frac{1}{2}x\frac{3}{4}$ ,  $\frac{3}{4}x\frac{5}{16}$  and minus  $\frac{5}{16}$ . Old Ben No. 15 plant includes a double-roll crusher for breaking lump to screenings. The rescreener, which includes the  $3x\frac{1}{2}$ -in. washer followed by a "Gyrex" vibrator, makes 3x2,  $2x\frac{1}{2}$ ,  $1\frac{1}{2}x\frac{5}{16}$  and  $\frac{5}{16}x0$ . It was found that when 3x2 and  $2x\frac{1}{2}$  were placed in the storage bins, breakage and fines resulted in dulling their appearance. Consequently, a degradation screen equipped with water sprays was in-



This trademarking machine at Zeigler presents a gummed label to be placed on a lump.

stalled to clean these sizes before loading. The spray water is settled in earth ponds. Results moved the company to install similar equipment for 6x3, even though that size is loaded directly.

Preparation facilities at Old Ben 14 include the main tipple and the Old Ben "Processing Plant" for stoker coal. Sizes up to 3-in. may be shipped from Nos. 8, 11 and 15 mines to the No. 14 processing plant. The main tipple, in addition to picking and washing facilities, includes a Link-Belt double-roll crusher for coal over 3-in. This crusher, with the American ring mill preceding the processing plant, permits breaking the entire output to minus \(\frac{3}{2}\)-in, for stoker, Processing-plant facilities also include a track hopper, by which crushed coal from the main plant or from other Old Ben mines may be started through the crushing and rescreening process.

#### Fine Sizes Air-Cleaned

Primary screening equipment in the processing plant consists of ash-board shakers producing  $2x1\frac{1}{2}$ -,  $1\frac{1}{2}x\frac{3}{4}$ - and minus  $\frac{3}{4}$ -in. sizes. The latter goes to four "Selectro" vibrators for dedusting and separation into  $\frac{3}{4}x\frac{7}{16}$ - and  $\frac{7}{16}$ -in.x10-mesh. The  $\frac{3}{4}x\frac{7}{16}$  is cleaned on two American "Twin-Dex" pneumatic separators. Storage bins accommodate the various sizes and equipment is provided for mixing  $\frac{3}{4}x\frac{7}{16}$ -in. and  $\frac{7}{16}$ -in.x10-mesh.

All Old Ben plants include tramp-iron-removal equipment and are equipped to dustproof all sizes with 600-second or heavier oil, using Viking heating and spraying equipment. Typical consumption at No. 8 is: lump, 3 pt.; furnace, ½ gal.; ¼x½-in., 1 gal.; ½-in.x10-mesh, 6 to 7 qt.; other sizes in proportion. Old Ben trademarks its larger sizes by spraying them with a special green dye, while smaller sizes, such as the special stoker made at No. 14, are trademarked by

feeding into them a certain percentage of one size fraction, called "marbles," which have been sprayed with a green lacquer. This was done because spraying the entire product did not provide the desired green color. No. 14 equipment includes a Manierre box-car loader, with an Ottumwa portable belt-type unit at No. 8.

#### **Dry Plant Prepares Stoker**

Kathleen mine, Union Colliery Co., is another equipped with a dry plant for stoker preparation. Sizes made in the main tipple (6-in, lump, 6x3-in, egg and 3x2-in. nut) are hand-picked and boomloaded. One special Jeffrey crusher is installed for large coal. Coal under 2-in. is cleaned in a Roberts & Schaefer addition containing one 3- and one 4-ft.-wide Stump "Air-Flow" cleaner and "Gyrex" screening equipment for making 2x11-, 14x4-, 4x16- and 16-in.x10-mesh sizes. Mixing equipment permits combinations of all sizes and all may be dustproofed with Socony-Vacuum 350-second spray oil (Viking equipment). Average consumption, all sizes, is 6 qt. per ton.

Dedusting before washing may be done at the new refining plant at the Royalton No. 7 mine, Franklin County Coal Corporation, which includes the first bituminous Menzies cone separator. The plant, designed and built by Koppers-Rheolaveur, is equipped with a track hopper to permit surplus coal made on the day shift to be dumped and cleaned at night; also coal from Energy No. 5 mine, when desired.

The 6-in, lump and 6x3-in, furnace lump made in the main tipple at Royalton are hand-picked (Westinghouse mercury-vapor lights) and boom-loaded. The 3x2-in, coal goes directly to the refinery-plant feed conveyor. Minus 2-in, coal may be binned ahead of the refinery-feed conveyor or rescreened into  $2x\frac{x}{10}$  and  $\frac{x}{10}$ x0-in, sizes preparatory to dedusting the

minus ½ at 10-mesh before binning. The refinery feed therefore consists of 3x2-in. from the main shaker and 2x0-in. or 2-in.x10-mesh from bins in the rescreening plant. Any excess of 2x0 is run into railroad cars for preparation on the second shift. Degradation and bony pickings in the main plant also are crushed to 2-in. and binned preparatory to cleaning. Lump

Electric Coal Cos., employs a Koppers-Rheolaveur plant with a maximum capacity of 800 tons per hour to clean, screen and dry 4x0-in. coal. The original Jeffrey tipple now is used to screen out, hand-pick and load 7-in. lump and 7x4-in. egg. It includes a crusher for bony pickings (sent to the washing plant) as well as crushing equipment for lump or



These centrifuges at Fidelity No. 11 dewater minus 1/4-in. washed coal.

and egg may be given the same treat-

All coal to the refinery goes into the Menzies cone separator, which originally was designed to handle only  $3x_3^3$ . Rated capacity is 160 tons per hour but the cone has handled efficiently as high as 300. Minus §-in. coal was added primarily to wet it for further cleaning. Clean coal from the cone is separated into  $3x_2^2$ ,  $2x_2^1z_2^2$ ,  $1z_2^1x_1^2$ ,  $3x_3^2$ - and minus §-in. fractions. All except the latter go either to the car or to a mixing conveyor, which also can carry all sizes over 1-in. to an American ring mill for reduction to screenings and remixing.

### Fine Coal Washed

Minus 3-in. coal from the classifying shakers flows with the water to a sump feeding two 28-in.-wide Koppers-Battelle launder-type fine-coal washers. Middlings are recirculated and clean coal is sized and dewatered on a Symons horizontal vibrator, which separates the coal at 10mesh. When the refinery feed has been dedusted, minus 10-mesh coal and water goes to the sludge pond. If the coal has not been dedusted, the minus 10-mesh goes with the \$-in.x10-mesh to a boot feeding two Carpenter centrifugal dry-These dryers reduce surface moisture from 14 to 22 per cent to 5 to 6 per cent. The dried coal goes to the mixing All sizes at Royalton No. 7 conveyor. may be dustproofed.

Fidelity No. 11 strip mine, United

egg or both, usually the former. An auxiliary picking table is installed for crushed lump.

Raw 4x0-in. coal from the tipple, plus crushed coal or pickings, is fed to two 48-in.-wide Rheolaveur coarse-coal washers. Regulating material is recirculated while middlings and refuse go to a similar rewash unit. Refuse from this rewash unit is the final refuse, middlings are recirculated and the clean coal is discharged to a vibrating screen equipped with \$\frac{8}{5}\$- and \$\frac{5}{16}\$-in. square-mesh with cloth. Undersize goes to the washed-coal classifying shakers, while oversize is discharged into an American ring mill for reduction to minus 14-in. and recirculation to the washers.

Two 8-ft.-wide sizing shakers separate the washed coal into 4x2-, 2x11-, 11x1-, 3x3., 3x4. and 15x4., and minus 4. plus some 5.in. sizes. The latter goes to a boot feeding a fine-coal washer. Thus, the fines are washed twice. Larger sizes go onto loading booms or into a mixing conveyor which also can place them on a return conveyor to the main tipple for mixing with the larger sizes. The washery mixing conveyor also carries degradation and coarse sizes to an American ring mill for reduction and rescreening when desired. To add to stoker-coal output, an additional crusher and vibrator equipment handling washed-nut sizes is scheduled for installation.

Coal from the fine-coal washer (minus  $\frac{1}{16}$  and  $\frac{1}{4}$ -in.) is dewatered in a washed-

coal boot and delivered to "Gyrex" vibrators for removal of the minus 48-mesh material (to sludge pond) preparatory to drying in three Carpenter centrifugals. These reduce "visible" moisture to around 6 per cent, the dried coal going to the mixing conveyor for loading or mixing. Refuse from the fine-coal washer is sluiced to an 8-mesh vibrator, oversize going to the refuse bin and undersize to the sludge pond. All Fidelity sizes may be dustproofed with either 300- or 400-second oil (Viking equipment), depending upon the season, or with an oil emulsion.

### Wash From 6-In. Down

Three mechanical-cleaning plants are operated by the Peabody Coal Co. in southern Illinois (Black Arrow No. 18, Harco No. 47 and Majestic No. 14). These commonly wash from 6-in. down, usually after dedusting, use magnets ahead of washers and operate rescreeners for small washed coal, including storage bins fitted in most cases with proportioning feeders. All three plants split the tonnage and wash on two shifts, reasons being a reduction in the scope and cost of preparation equipment and greater flexibility. Harco No. 47 also handles practically all the output of Harrisburg No. 43 mine. All plants have box-car loaders and automatic equipment for feeding round cardboard trademarks into the coal. Dustproofing (Viking equipment) is based on 350-second Standard, or 350or 600-second (winter) Socony-Vacuum, spray oil.

The preparation cycle at the three plants is substantially the same. At Majestic No. 14, mine-run goes onto a shaker screen making, normally, 6-in. lump and a 6x0-in. resultant. The screen also can take out a minus 2- or 1½-in, fraction for loading direct or rescreening. The 6-in. lump is hand-picked. Pickings are reduced to minus 6-in. in a Link-Belt double-roll crusher and sent to the washer. A mixing conveyor for all sizes is part of the original tipple equipment.

Part of the minus 6-in. coal may be washed directly and the remainder loaded into railroad cars for washing on the second shift. This minus 6-in. coal, whether from tipple or track hopper, is passed over a Niagara vibrator to take out minus 15 in. for dedusting at 28-mesh on two Tyler 400 electric screens. It then rejoins the 6x 15-in. size and passes over a Dings magnetic pulley into a McNally-Norton automatic washer. Primary refuse goes out while secondary refuse is screened to recover the plus 2-in. for crushing to minus 2-in. (McNally-Pittsburg single-roll crusher) and recirculation.

Classifying screens separate the washed coal into 6x3., 3x2., 2x1½., 1½x1½. and minus ½.in. sizes. The latter is dewatered on high-speed shakers and combined with the 1½x1½ for loading or transportation to the rescreening plant. The 6x3- and 3x2-in. sizes also may be combined and conveyed to Niagara vibrating equipment

for rescreening into the original sizes preparatory to loading. Also, 3x2 or  $2x1\frac{1}{2}$ , or both, may be broken down (McNally-Pittsburg single-roll crusher) to  $1\frac{1}{2}$ -in. and loaded.

The Majestic No. 14 rescreening plant receives either minus 2- or minus 1½-in. coal, which may go directly to a storage bin or to an Allis-Chalmers "Lo-Head" vibrator to take out plus 1-in. material for reduction to minus 1-in. in a McNally-Pittsburg single-roll crusher, both the natural and crusher products going into a 1-in. screenings bin. Or the separation may be made at ¾-in. on a Niagara vibrator and the crushing done in an American ring mill ahead of the ¾-in. screenings bin.

Under the Black Arrow No. 18 set-up, mine-run, 6-in. resultant and other sizes, either natural or crushed, may be run to railroad cars for redumping and preparation on the second shift. Ordinarily, however, the mine-run shakers produce 6-in. lump, 6x2 or 6x11, and 2x0 or 12x0. The 6x2 or 6x12 is washed on the same shift, along with part of the screenings. Most of the 2 or 12x0, however, is loaded for second-shift preparation. The 6-in. lump goes either to a picking table or to a Norton pick breaker for reduction to minus 6-in. and then to the table. Bony pickings are reduced to minus 2-in. in a Link-Belt double-roll crusher and returned to the coal flow. In addition, any size from 6- down to 12-in. may be reduced to 12-in. for washing or loading raw.

As Harco No. 47 also prepares Harrisburg 43 coal, the custom there is to wash 6x0 on both shifts, although the Black Arrow practice may be followed. While the mine-run shakers can separate the coal into several intermediate grades to facilitate crushing, the sizes normally are 6-in. lump (hand-picked, with bony crushed and run to the washer),  $6x1\frac{1}{2}$  and  $1\frac{1}{2} \times Q$ . Part of the 6-in. lump may be crushed and the rest loaded for recirculation and crushing at night. And 6x3 or other similar size may be broken down in a McNally-Pittsburg single-roll crusher to minus 3-in. and discharged onto a Tyler-Niagara screen to take out oversize for recirculation while the undersize goes through the regular dedusting and washing procedure. Other procedures are possible at both Black Arrow and Harco but the ones given are the usual.

### **Hopper for Night Operation**

In night-shift operation at Black Arrow, railroad cars are dumped into a track hopper followed by a feeder and Link-Belt double-roll crusher for reducing mine-run or lump, if being processed, to minus 7-in. The coal then comes up to the night shaker which takes out minus  $1\frac{1}{2}$  in. for dedusting prior to washing. Plus  $1\frac{1}{2}$ -in. also is run to the washer or first crushed and then washed. The track hopper at Harco 47 is equipped with a McNally-Pittsburg double-roll crusher for reducing mine-run or lump

to less than 6-in. or for taking smaller sizes down to minus 3-in. From the hopper the coal is brought to the regular screens on a 42-in. Goodrich belt. A bypass belt, however, can take the coal straight to the washer, in which case it is not possible to dedust in advance.

Screenings may be loaded raw or washed, with or without dedusting, at either plant. At Black Arrow, dedusting is done on four 4x8-ft. Link-Belt vibrators (28-mesh stainless-steel cloth) preceded by two Link-Belt double-deck vibrators separating the feed into 2 or 1½x¾, ¾x¾ and minus ¾, the latter going to the dedusting units. This separation scheme permits still further crushing: viz, plus ¾-in. coal off the top decks of the scalping screens (Link-Belt double-roll crusher). A Dings magnetic pulley precedes the screens.

Screenings to be dedusted at Harco go first to Tyler-Niagara 600 vibrators, where minus 1-in. is taken out for additional screening at  $\tilde{r}_8$ -in. on Tyler 400 electric equipment. The minus  $\tilde{r}_8$ -in. size goes to an "Algar" aspirating-type deduster and then onto another 400 electric screen to finish removal of minus 28-mesh material, which is stored or burned in the power plant when no other outlet is available.

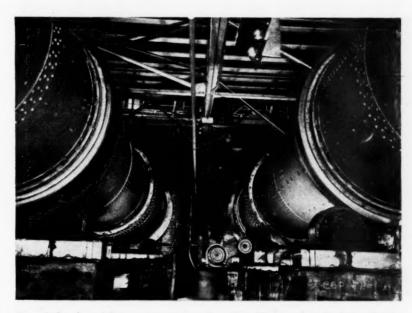
Washing at both plants is done in Link-Belt air-operated jigs with mercury-switch controls developed at Harco for more positive off and on operation of the reject mechanism. The washer at ary refuse ordinarily is crushed and recirculated. At Harco, refuse is run over a Tyler-Niagara screen to take out minus 1-in.; oversize is crushed and recirculated.

Classifying screens at both properties separate the washed coal into 6x3, 3x2, 2x1½, 1½x1, 1x¾, ¾x½ and minus ½, the latter to high-speed wedge-wire shakers for dewatering at approximately 28-mesh. The sizes may be loaded separately or in combination, run to the rescreening plant or crushed. Washed-coal crushing equipment at Black Arrow (McNally-Pittsburg) can break any or all sizes down to 1 in. An American ring mill at Harco does the same to plus ¾-in, coal.

#### Rescreener Handles Fines

From the classifying and dewatering screens at Black Arrow all 1½-in.x28-mesh coal can be conveyed to a rescreener with storage bins, two with lowering chutes, for 1½x1-, 1x¾-, ¾x√6-and ½-in.x28-mesh. Rescreening is done on two Tyler-Niagara vibrators, and the 1½x1 and 1x¾ may be diverted to an American ring mill for reduction and recirculation to the same screens. The bins are fitted with star gates operated by U. S. "Varidrive" variable-speed gears to permit making prescription mixes.

A new rescreening and prescriptionmixing plant was building at Harco at the time of the *Coal Age* survey. It includes four bins for the same sizes as at Black Arrow. Rescreening likewise will be done by vibrators. Star gates, how-



Two of the three kiln-type heat dryers for minus 3/6-in. coal at Bankston Creek preparation plant.

Harco is preceded by a Dings magnetic pulley and at Black Arrow by a similar pulley, a surge bin and a Merrick "Weightometer." Magnetic pulleys ahead of the washers, among other things, divert heavy pieces of metal which might damage the screens or damage or clog the reject gates. Part of the second-

ever, will be operated off a lineshaft. Thus, changes can be made only by changing sprockets, and the chance of getting percentages wrong by accidentally or carelessly varying feeding rates is eliminated.

Complete new mechanical-preparation plants in southern Illinois include the

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Bankston Creek operation of the Bankston Creek Collieries Co., an affiliate of the Sahara Coal Co. Designed and built by McNally-Pittsburg, Bankston Creek, rated at 825 tons per hour, prepares coal for the Bankston Creek Nos. 4 and 5 deep mines, No. 5 seam, and Bankston Creek No. 6 stripping, No. 6 seam.

Coal from the two seams is prepared on separate shifts, with the No. 4 mine product coming in by rail and the No. 5 mine output direct from the slope. Bankston Creek No. 6 coal is dumped into the two mine-run hoppers by the automotive haulage units. The two hoppers hold 100 and 150 tons and are equipped with variable-speed feeders (Reeves variable-speed drives) controlled from the plant operator's station. No. 5 mine coal also may be dumped into railroad cars for later preparation or into the 150-ton hopper. Rock from No. 5 mine (brought up on the same belt) is diverted to a separate rock hopper.

#### Pickings Crushed and Washed

All coal from 6-in. down is washed at Bankston Creek. Ordinarily, in addition, No. 6 seam lump is crushed and washed. No. 5 seam lump (6-in.), however, is shipped, and is loaded over a boom or run to an Ottumwa scraper-line box-car loader. When making lump, pickings are crushed and sent to the washer. When crushing, only heavy rock is removed and the coal is sent to the same crushing unit.

The main belt serving Bankston Creek is equipped with a Merrick "Weightometer," with another on the final refuse belt. Mine-run, with the lumps broken usually to 18-in. and sometimes to 10-to 12-in. by a pit crusher, is discharged onto shakers normally making 6-in. lump, 6x3 and 3x0, with provisions for cutting out 1x0, when desired, for dedusting on Tyler 400 electric screens. Lump, if

crushed, is combined with the 6x3-in. fraction to serve as bedding material in a McNally-Norton automatic washer. Two additional McNally-Norton washers clean 3x0-in. coal. All 3x0-in. refuse is rejected. Secondary 6x3-in. refuse is crushed and dropped onto the main belt for recirculation.

Clean coal from all washers goes onto classifying screens for separation into 6x3-, 3x2-, 2x1½-, 1½x1- and 1x0-in. fractions, the latter flowing with the water to two Tyler 400 screens for separation into 1x¾- and minus ¾-in. sizes. The minus ¾-in. goes to six shakers (450 sq.ft. of wedge-wire and Bixby-Zimmer round-wire screens) for dewatering at ½ mm.

The washed-coal sizes may be loaded separately, including into box cars, mixed or used in making household stoker fuel. In this activity, any or all sizes over 1-in. are conveyed to a McNally-Pittsburg double-roll crusher for reduction to minus 1-in. Crushed coal is separated into plus \(\frac{3}{8}\)-, \(\frac{3}{8}\)-in.x10-mesh and minus 10-mesh sizes on Tyler-Niagara screens. Oversize is recirculated to a second McNally-Pittsburg stoker-coal crusher with pyramidal teeth.

Minus \(\frac{3}{8}\)-in, washed coal, after the regular dewatering, may be dried in one, two or three Christie dryers (7\frac{1}{2}\)x60-ft, shells, 33 tons per hour each). Each dryer can operate independently. Dried coal may be loaded by itself or combined with other sizes. Gas temperatures usually are: dryer inlet, 1,200 deg. F.; outlet from center chamber to outer coal compartment, 350 to 400 deg. Temperature of the coal leaving the dryer is around 120 deg. A fire has never been experienced, due, in considerable degree, to the stoker equipment used (Firite spreader).

Coal enters the dryers carrying a surface moisture of around 9 to 10 per cent, which is reduced to about 1 per

cent, or as low as possible without creating dust. A little moisture, in fact, makes the coal take oil better in dust-proofing. The latter is done with 350-second spray oil in the summer, using the Brown-Fayro cold-oil spraying system. In winter, viscosity is cut to 200 seconds and steam is run through coils in the storage tanks.

Coal from the Zeigler Nos. 1 and 2 mines of the Bell & Zoller Coal & Mining Co. is cleaned on separate shifts in a central preparation plant rated at 1,000 tons per hour. The No. 2 mine product discharges from weigh baskets directly to the main belt feeding the plant. No. 1 mine coal comes in in company-owned railroad cars, dumped into a 70-ton hopper by a Mead-Morrison dumper. From the hopper the coal is fed onto the main 54-in. Manhattan belt fitted with a Mer-

rick "Weightometer."

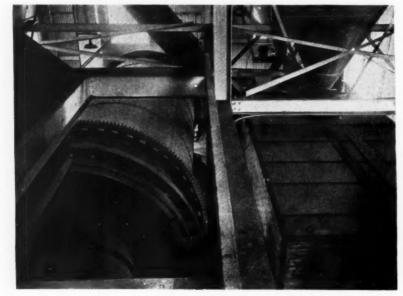
All sizing in the Zeigler plant (Robins design, Chance cones and Stump "Air-Flow" cleaners) is done on vibrating screens or grizzlies. Usual primary sizes are: 6-in. hand-picked lump, washed 6x3-in. furnace, 3x2-in. small egg, 2x1½-in. stove, 1½x¾-in. chestnut and ¾x1½-in. pea; air-cleaned ½-in.x10-mesh buckwheat, or stoker; and 10-mesh dust. Raw minus ½-in., or carbon, is frequently loaded, and provision is made for producing 1-in. screenings at will by crushing part or all the stove or chestnut and combining the product with natural sizes under ¾ in. Additional crushing equipment is available for lump and other coarse sizes.

#### Trademark With Cards

All sizes are loaded over booms and Viking equipment is installed for dust-proofing with oil or wax. An Ottumwa scraper-line box-car loader permits box-car shipments of sizes down to and including stove. Trademarking of lump and other sizes is made possible by "Dustlix" equipment which automatically feeds gummed cardboard labels into the smaller sizes or into a man's hand to be pasted on lump. Housekeeping is aided by a United States-Hoffman vacuum-sweeping system.

Incoming mine-run at Zeigler is split into plus and minus 6-in, fractions by a grizzly, the lump going to a picking table (Westinghouse mercury lights). Pickingtable refuse is broken to minus 6 in. in a Jeffrey single-roll crusher preparatory to washing. Minus 6-in. coal from the first grizzly is run over a Stearns magnetic pulley to a second grizzly, which separates it into 6x12. and minus 12.in. fractions, the former, plus crushed pickings, going to a 162-ft. Chance cone. Minus 12-in, material passes to "Gyrex' screens which split it into 12x16. and minus 15-in. sizes, the former going to a 13½-ft. Chance cone.

Refuse from the coarse-coal cone, after desanding, passes over a Stearns magnetic pulley into a Pennsylvania single-roll crusher for reduction to minus 1½-in. and elevation, with degradation from the sizing screens, to a Symons horizon-



This rotary-type heat dryer at Delta handles coal up to I-in.

tal vibrator which takes out oversize, particularly flats, and returns them to the coarse-coal cone, while minus 1½-in. undersize goes to the fine-coal cone for re-treatment. Refuse from the fine-coal cone, after desanding, is rejected. Clean coal from both cones is desanded and sized on a series of "Gyrex" and "Vibrex" screens before going to the loading booms or mixing conveyors.

Minus ½:in. coal, made as above, may be loaded raw but usually is elevated to Tyler 400 electric screens for dedusting at 10-mesh, the dust going to storage and loading bins. The ½:in.x10-mesh coal then goes to a surge bin ahead of eight Stump "Air-Flow" cleaners. Middlings from the primary cleaners are recirculated to two re-treatment units. The cleaned coal passes to its own loading boom or to the mixing conveyor.

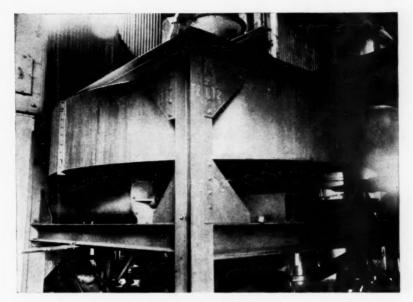
#### Screening Done on Vibrators

All screening also is done on vibrating equipment in the new plant serving Blue Bird No. 6 mine, Blue Bird Coal Co. Mine-run brought up on a Goodyear belt goes onto a three-deck "Gyrex" for separation into 6-in. lump, 6x3-in. egg and a 3-in.x10-mesh resultant, plus dust. Lump and egg flow to a Robins picking and distributing chute (shaking type) equipped with rescreens, and then onto loading booms. Bony pickings are reduced to minus 13-in, in a Jeffrey single-roll crusher and go with the 3-in.x 10-mesh coal to a Morrow "Multiflow" washer. This same crusher may be used to break down lump or egg or both and thus reduce the entire mine output to minus 12-in., if desired.

Blue Bird also can work on a drycoal schedule providing, normally, for 6-in. lump, 6x3-in. furnace, 3x2-in. egg (picked on the loading boom) and 2-in. screenings, as well as such combinations as 6-in, mine-run. Capacity of the washing installation is 100 tons per hour. Washed coal is discharged onto an Allis-Chalmers "Lo-Head" horizontal vibrator for dewatering on No. 10 square-mesh cloth. Dewatered coal then is sized (Allis-Chalmers "Aerovibe" screen) into 3x2-, 2x12-, and 12-in.x10-mesh. The latter, if desired, may be further separated into 13x1- and 1-in.x10-mesh on a Tyler 400 electric screen. All sizes may be dustproofed with "Conoco" spray oil.

The air-operated jig in the Delta plant, Delta Coal Mining Co., designed and built by Link-Belt, now commonly cleans 6x0-in., although installed for 3x0 only. Delta has installed a Link-Belt "Roto-Louvre" dryer for coal up to 1-in. and a Howe continuous centrifugal separator for recovering and dewatering minus 10-mesh fines.

As at most operations employing minerun hoppers, including all strip mines, the feeder under the Delta hopper is equipped with a variable-speed drive (Link-Belt P.I.V. gear) to permit varying the feeding rate onto the main belt, equipped with a Merrick "Weightometer." The 6-in, lump made on the mine-



Minus 10-mesh fines are reclaimed and purified in this continuous separator at Delta.

run shakers is hand-picked on a shaking table, while the 6x0 (or 3x0), plus crushed bony pickings, goes to the Link-Belt jig, equipped with "Electric-Eye" reject control. Washed coal is sized to 6x3, 3x2, 2x1½, 1½x¾, ¾x¾ and minus ¾, the latter to high-speed shakers for dewatering at 10- or 28-mesh. The various sizes may be loaded individually or mixed as desired. Crushing equipment permits reducing all sizes from 6-in, down to ¾-in, to minus ¾-in., if desired, either for loading or rescreening. Delta dust-proofs with hot oil, using the Viking system.

Capacity of the Delta "Roto-Louvre" dryer is 100 to 125 tons per hour. Drying gases originate in a Bigelow-Liptak furnace fired by a "Unipulvo" grinding mill. The dryer is operated primarily to reduce surface moisture below the freezing limit in winter, although it also can supply coal to definite moisture specifications. Designed capacity of the Howe separator installed this summer is 26 tons of minus 10-mesh fines per hour. On the basis of experience to date, recovery is approximately 75 per cent of the feed. Ash in the fines to the separator varies from 15 to 27 per cent, with the average around 18 to 19 per cent. Ash in the recovered fines is around 12 to 13 per cent.

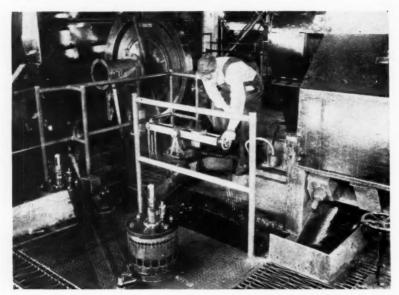
Two stripping mines (Pyramid Nos. 1 and 3) are served by the new Pyramid preparation plant of the Pyramid Coal Corporation, designed and built by McNally-Pittsburg. With a rated capacity of 1,000 tons per hour, this plant employs three washers to clean all coal from 7-in. down. As coal from No. 3 is brought in by rail, a Link-Belt rotary railroad car dumper is installed on one side of the 450-ton mine-run hopper equipped with a variable-speed feeder discharging into a double-roll breaker which can be set to reduce lumps to 8-, 10- or 12-in.

The mine-run shaker, fed by a 48-in. U. S. Rubber belt, separates the coal into 7-in. lump, 7x4, 4x1\(\frac{1}{4}\) and minus 1\(\frac{1}{4}\). The 7-in. lump is hand-picked, with bony pickings going to a crusher for reduction and return to the main belt. Minus 1\(\frac{1}{4}\)-in. screenings may be loaded raw, but normally go to a McNally-Norton automatic washer. Additional washers are provided for 4x1\(\frac{1}{4}\) and 7x4, the latter a three-compartment unit. Secondary refuse from the 7x4 and 4x1\(\frac{1}{4}\) units is crushed and recirculated to the main belt.

#### Two Shakers Size Coal

Cleaned coal is sized on two sets of shakers into 7x4-, 4x2-, 2x14-, 14x4-, x3- and minus 3-in. sizes. Water and minus 14-in, degradation from the coarsecoal shakers go to a settling tank, from which the coal is returned to the finecoal shakers. Minus 3-in. coal from the latter is dewatered on high-speed shakers equipped with 2-mm. round-wire screens (Bixby-Zimmer) which have materially improved dewatering efficiency and reduced the loss of coal resulting from slot enlargement. About twice as much minus 1-mm, material is retained in the dewatered coal after passing over these screens, while the moisture content of the coal is 3.25 per cent lower.

All sizes, whether hand-picked or washed, may be loaded separately or mixed in a mixing conveyor. Degradation is recirculated to the fine-coal classifying shakers. This same mixing conveyor also can deliver any size to the crushing and stoker-coal plant, the coal first going into a 30x60 McNally-Pittsburg cone-toothed double-roll crusher and then onto a Tyler-Niagara screen for removal of the oversize on 1½-in. square-mesh cloth. This oversize goes to a second cone-toothed double-roll crusher and then joins the product through the vibrator for elevation to a triple-deck "Gyrex"



Crushed secondary refuse from the 2x0-in. washer is cleaned in this small auxiliary unit at Burning Star.

sizing screen (1½-, ¾- and ¾-in. square-mesh cloths). All sizes made on the screen, except ¾x0, can go to the fine-coal classifying screen, to the mixing conveyor or to one loading track. The crushers in the stoker-coal system are protected by a Dings chute-type magnet.

All sizes at Pyramid may be dustproofed with Cross "No-Kol-Dust," using the Viking system. Viscosity usually is 600 seconds, varying somewhat between summer and winter.

All coal from 6-in. down is washed at the Streamline strip mine of the Southwestern Illinois Coal Corporation, and provision is made for primary and secondary crushing, middlings crushing and recirculation, mixing (both on classifying screens and in a mixing conveyor), and dustproofing of all sizes, using oil and Viking equipment. The plant, designed and built by McNally-Pittsburg, features practically complete gravity flow from incoming belt to loading booms.

#### Variable-Speed Feeder Used

A variable-speed feeder under the pit hopper passes the coal to a bar screen taking out plus 6-in. for reduction to a top size of 21- down to 6-in. in a McNally-Pittsburg double-roll crusher. In the plant, the mine-run is divided into 6-in. lump (hand-picked, with bony pickings crushed prior to washing) and 6x3- and 3x0-in. resultants. The 6x3 goes to one McNally-Norton automatic washer while the 3x0 is split between two additional units. Secondary 6x3 refuse goes to the middlings crusher, while secondary 3x0 refuse is first screened to take out minus 14-in. material. Crushed middlings and bony pickings are recirculated to the main belt.

Cleaned coal from all washers, plus hand-picked lump, flows onto two sets of classifying shakers for separation into 6-in. lump, 6x4, 4x2, 2x1½, 1½x¾, ½x½ and minus ½. The ¾x¼ is rescreened for complete removal of fines on a Symons horizontal vibrator. Minus ½-in. goes to high-speed dewatering screens fitted with ½-mm. Bixby-Zimmer round-wire screens which have improved dewatering efficiency and substantially reduced coal loss.

All sizes may be loaded separately,

A small auxiliary washer is used to clean secondary refuse from the fine-coal unit at the new Burning Star plant of the Truax-Traer Coal Co., designed and built by McNally-Pittsburg. Minerun comes into the plant on a chain-and-flight conveyor, discharging into a double-roll breaker reducing lumps to as low as 7-in. Breaker and conveyor are electrically interlocked so that if the mine-run feeder stops, the rest of the plant shuts down.

#### Clean in Three Washers

From the breaker the coal drops onto mine-run shakers which separate it into 6-in. lump, 6x2- and minus 2-in. Lump is hand-picked. Bony pickings are crushed and returned to the mine-run screens. Lump also may be run to this same crusher for reduction and recirculation. The 6x2- and 2x0-in, sizes are cleaned in "streamlined" McNally-Norton automatic washers. Secondary 6x2 reject is crushed and run to the fine-coal washer for retreatment, while secondary 2x0 reject, after crushing to minus 12-in., is discharged into a small two-compartment auxiliary washer, also with automatic reject control.

Clean coal from the washers flows to shaking classifying screens for separation into 6x3 or 6x4, 4x2 or 3x2, 2x1½, 1½x¾, ¾x½6 and minus ⅓6. The minus ⅙ discharges to two "Gyrex" screens for preliminary dewatering on ½-mm. stainless steel "Ton-Cap" cloth. Final dewatering is done on high-speed shakers



Special Royalton No. 7 refuse truck spreading a load with the rear door.

six on booms, or mixed in any desired combinations. The mixing conveyor is arranged so that sizes over 1½-in. may be run to an American ring mill for reduction to minus 1½-in, screenings. In winter, ¾x½-in, and ½-in,x½-mm, may be treated with calcium chloride by hoppers and feeders over the loading boom or loading belt.

equipped with bronze wedge wire. The  $\frac{3}{4}x\frac{5}{56}$ -in. size also may be dewatered on a "Gyrex" screen or run directly to the loading point.

All sizes at Burning Star may be loaded directly or placed in a mixing conveyor for making combinations. The mixing conveyor also delivers coal to an elevating conveyor to a stoker-coal

crushing and screening plant. The coal to be crushed first is presized in a 30x54-in. single-roll crusher and then is run over a "Gyrex" screen to take out minus 3, which is bypassed around the final crusher, a 24x48 double-roll McNally-Pittsburg stoker-coal unit taking the feed down to 14-in., which may be varied within about a 1-in, range. The crusher product may be loaded or mixed or may be discharged to two additional "Gyrex" screens for separation into plus 12-, 12x3- and minus 3-in. sizes, the first two going back to the classifying screens while the minus 3 is loaded or mixed.

All sizes may be dustproofed with Viking equipment. The dust-proofing me-Burning Star is 1,500-second "No-Kol-Dust." This high viscosity was pioneered at the company's Fiatt operation, primarily to overcome absorption and loss of dustless character with a porous coal. Because the high-viscosity product is not absorbed, the quantity may be materially reduced and a better job results.

#### Fines to Sludge Ponds

Wash-water systems at practically all southern Illinois plants are based on separating out the fine material (anywhere from 10- down to 48-mesh) and routing it to refuse or a sludge pond. One exception is Delta, where, as noted, a centrifugal separator has been installed to reclaim and clean 10-mesh fines. Before this installation, sludge-handling followed the usual plan of collecting water and fines from the dewatering screens in a sump, pumping them (Goulds 4,000g.p.m. centrifugal) to a settling cone, returning the clarified overflow to the washer by gravity and pumping the settled-out sludge to a pond (3-in. Deming-Mueller unit). As at most washing operations, fresh make-up water (one of two Deming "Triplex" pumps) is added by sprays over the classifying and dewatering screens.

One of two pond pumps supplies fresh water to a 1,200-g.p.m. Dayton-Dowd booster pump (with 600-g.p.m. standby) at Bankston Creek. With a plant capacity of 825 tons per hour, make-up usually averages 1,000 g.p.m. Circulating-water pumps include one Dayton-Dowd and three McNally-Pittsburg 5,000-g.p.m. units. Sludge is pumped out by a 6-in. Morris unit. At Streamline, sludge runs to the pond by gravity. From this pond, clean water flows to a make-up pond. Peerless and American Well Works deep-well pumps, adaptable to well service if desirable, supply make-up water.

But while settling cones are the most numerous, sumps, tanks and thickeners have been pressed into service. At the Royalton No. 7 plant, where a sludge tank supplies the Koppers-Battelle washers, water and 10-mesh material through the final dewatering screen go into a boot serving Carpenter dryers. Overflow from the boot goes to the pond for clarification and reuse.

Fidelity No. 11 mine incorperates an

85-ft. Dorr thickener in the wash-water circuit, primarily to recover water and thus conserve the fresh supply. This thickener receives material through the wedge-wire sieves over which is passed regulating material from the fine-coal washers and effluent from the Carpenter dryers. Pulp is pumped to the sludge pond. Clarified water is returned to the plant by a 3,500-g.p.m. Morris centrifugal.

Minus 10-mesh and water from the dewatering screen at Blue Bird No. 6 fall into a settling tank, from which fines are removed to the refuse by a scraper conveyor. Clarified water is recirculated to the washing unit by a Mor-

ris 10-in. pump.

Water and 10-mesh coal from the dewatering screens in the New Orient plant flow to a sump from which a Morris 8-in. circulating pump lifts them to a column pipe feeding the washer head tank. Sufficient hydraulic separation is secured in this column, which bleeds to a sludge sump, to keep the fine-coal load in the circulating water down to reasonable limits. Water overflowing the sludge sump goes to the circulating-water sump, while the sludge is pumped to a "Vibrex" dewatering screen by a 3-in. Type K Morris pump. Dewatered sludge is rejected, water returning to the circulating-water sump.

#### Tank Supplements Cone

The usual settling cone at Pyramid is supplemented by a tank receiving minus 14-in, degradation and water from the coarse-coal shakers. This tank is on the lower floor of the washing plant. Coal removed by the drag scraper goes to the fine-coal classifying screens. Water from the tank is delivered through a series of skimmer troughs to an integral sump. From this sump, which also receives excess water from the regular settling cone, McNally-Pittsburg pumps recirculate to the 7x4-in. and 4x11-in. washers. These washers take about fourfifths of the circulating water and pumping head is reduced as compared with pumping from a low sump to the top of a settling cone. Also, none of this water passes through the fine-coal dewatering screens, thus increasing their efficiency.

The fine-coal dewatering screens mentioned receive water and minus §x0-in. coal from the classifying screens following the screenings (minus 14-in.) washer. Water and minus 4-mm. material through these screens goes to a pump sump (also receiving any overflow from the tank sump), from which it is pumped to the top of the settling cone. Clarified water flows by gravity back to the screenings washer, while sludge goes out in a concrete-lined trough

to ponds in old spoil banks.

Motor trucks are most used for refuse disposal at southern Illinois mines. A Leschen aerial tramway serves Kathleen, with an Atlas larry powered from a storage battery at Valier. Royalton

No. 7 mine is equipped with a special new refuse-disposal truck designed to spread the material on the bank. Capacity of the truck (Autocar chassis and special "Garwood" end-dump body) is 10 tons. The rear door, which drops automatically as the body raises, is designed for spreading the refuse, as shown in the accompanying illustration. In addition, a bulldozer blade in front is useful for road-building, spreading purposes, etc.

Three-fourths of the southern Illinois preparation plants are powered by 440volt a.c. motors, with 220 volts a.c. for most of rest, excepting d.c. motors at some of the older deep-mine plants. Largest motors in use are 150-hp., mostly on crushers, pumps or raw-coal conveyors. In plants handling 500 to 1,000 tons per hour, number of motors varies from 35 to 100 and total connected loads usually range from 800 to 2,000 hp. Where washers were added to existing tipples the number of motors is large. For instance, at Fidelity No. 11, including a seldom-used crushing plant, there are 101 motors totaling 2,552 hp. In contrast, the Streamline plant, built as a unit, has only 36 motors totaling 851 Capacities are respectively 1,000 and 600 tons per hour. The largest unitbuilt plant at deep mines, the 1,000-tonsper-hour Zeigler central plant, built in 1935, is operated by 94 motors totaling 2,000 hp.

All preparation-plant a.c. motors are

All motors in the Harco 47 preparation plant are equipped with ball bearings. This 60-hp. 440-volt 1,200-amp. unit drives the mine-run shakers.





Nine 250-watt high-intensity mercury lamps illuminate the three picking tables at Royalton No. 7.

of the induction type. Motors wound for 220 volts are used in the three Peabody washing plants. Only ball-bearing motors have been bought in the past five years. A 1,200-r.p.m. speed is selected wherever practicable. All motors in the Harco No. 47 washing plant are ball-bearing equipped.

Rigid conduit, which gives wiring a maximum of protection, is used in practically all plants, two exceptions being tipples of the Consolidated Coal Co., which uses non-metallic trench-lay for both 440-volt motor and 110-volt lighting circuits. In a wooden structure, these cables are stapled to the wood. Where

they cannot be placed in a protected position below the floor, Greenfield conduit is used.

Automatic sequence starting is the practice in a few plants, such as Zeigler No. 2, Harco No. 47, Arrow No. 18 and Bankston Creek. The 94 motors in the Zeigler plant are started by pushing nine buttons-that is, there are nine sequence groups. At the Peabody mines, motordriven rotary switches start all motors in proper sequence, with timing depending upon speed of the rotary switch. At Bankston Creek, on the other hand, only the first five motors start in automatic sequence. Strictly dust-tight control equipments are used in the washing plants at Fidelity No. 11, Cutler-Hammer starters, and Royalton No. 7 (General Electric starters).

In 6 of 28 tipples covered in the electrical survey, high-intensity mercury lamps furnish picking light. One plant uses Cooper-Hewitt long-tube mercury lamps exclusively, another has some Cooper-Hewitts along with high-intensity lamps, one has fluorescent lamps and the rest Mazda incandescent lamps. The four Old Ben plants are equipped with 6.6-amp. street series lamps. Eight lamps are connected in series across 240-volt lines. Strength, long life and inadaptability to home utilization are the advantages. Picking tables at Blue Bird No. 6 are illuminated with four Benjamin three-tube fluorescent units.

### MERCHANDISING

### Southern Illinois Tonnage

ATURE and industrial developments combine to compel southern Illinois mines to sell their commercial tonnage in a broad, competitive cockpit. Strictly local markets are insignificant; last year, such markets absorbed only 3.0 per cent of the output of shipping mines in Franklin, Jackson, Jefferson, Perry, Saline and Williamson counties. Chicago-the biggest consuming center open to the southern Illinois field-is a major battleground in the constant struggle between Midwestern and southern Appalachian coals. And this competitive pattern is repeated in varying degree in every marketing area to which southern Illinois mines ship.

Under normal conditions of supply, freight-rate adjustments and the competitive pressure of both southern and northern Appalachian coals act as an effective barrier against the movement of southern Illinois tonnage east of the Indiana-Ohio boundary line. South and west, southern Illinois coals must meet the competition of the mines in those sections of the country. In the Northwest, lignite from North Dakota and Appalachian coals from the docks at the Head of the Lakes must be reckoned with, while, farther west, mines in the Rocky Mountain States stand ready to oppose an Illinois invasion.

Competition with Appalachian coals in consuming areas east of the Mississippi River and with Southwestern and Rocky Mountain coals in territory west of the Father of Waters, however, does not tell the whole story. Operations in the Eastern Interior Provinces (Illinois, Indiana and western Kentucky) wage a continual battle royal for possession of common markets. Oil and, more recently, natural gas have been claiming an increasing share of the fuel business. Consumption of these two fuels in the Upper Mississippi Valley States is the equivalent of several million tons of coal per annum.

Byproduct coke made from Appalachian coals also is a factor. High-temperature distillation of coal, using the Curran-Knowles ovens, was successfully established on a commercial scale in the southern Illinois field in 1933. Another carbonizing plant of the same type was erected in the Belleville district last year. Other plans to convert Illinois coals into a "smokeless" fuel also are under dis-

cussion at this time. The St. Louis market with its recent sweeping smoke-abatement ordinance probably will be the major objective of these plants.

Despite the complex interplay of competitive forces, southern Illinois producers have been able to sell their coal over a far-flung area. But concentration of tonnage in certain markets has been relatively high. Shipments of commercial coal normally are made to 20 States or more. The western belt of markets runs roughly from North Dakota south to Texas, with occasional scattering shipments still farther west. South and east, coal from this field reaches Michigan, Indiana, Kentucky, Tennessee, Mississippi and, at times, Alabama and Florida.

Although many States draw upon southern Illinois for part of their fuel supplies, more than two-thirds of the commercial tonnage shipped is consumed in Illinois itself and the west-bank cities of St. Louis, Mo., and Davenport, Iowa. In the last few years, however, the percentage sold to these markets has been declining; in 1932 it was 73.79 per cent; last year it was 63.84 per cent. During seven of the last eight years, Iowa has held second place, but in 1939 it was nosed out by Wisconsin. Commercial shipments since 1932 are summarized in Table I.

#### Why Coal Moves So Widely

The widespread distribution geographically can be attributed primarily to three major causes. These are: (1) the high percentage of prepared sizes produced in southern Illinois; (2) pioneering, consistent and effective merchandising promotion and (3), in recent years, special attention to the growing market for domestic-stoker coals. Labor disturbances in other producing fields have been a minor and fluctuating factor in the changing distribution picture. This is illustrated in the checkered history of movement to States such as Michigan, which, despite their proximity to Illinois, normally draw their major coal supplies from the Appalachian region.

Last year, 41.7 per cent of the output of the shipping mines in the six Illinois

"Domestic-stoker coal is now the tail which is wagging the dog in the Illinois producing field," is the way one large operator sums up the remarkable growth of demand for this fuel. "And before long," he adds, "there won't be any dog left. Many of our dealers who used to handle 30 to 40 cars per year of our egg and nut sizes are now handling 20 cars of stoker coal and only 20 of egg and nut." Another producer who began preparing a special stoker coal a few years ago has seen demand for this size increase 1,500 per cent in the short space of five years.

counties previously mentioned went to market as pea coal or larger. Screenings accounted for 31.7 per cent of the total production and mine-run for 10.9 per cent. This substantial proportion of prepared sizes enables this field to penetrate many markets which would be closed to it if only steam coals could be offered. Only 24.4 per cent of the output of the six counties was used by the railroads; approximately one-fifth of that tonnage came from the mine of a railroad subsidiary.

Further evidence of the influence of this high percentage of prepared sizes is afforded by the breakdown of sales of a group of major companies in this field. Last year this group sold 25.94 per cent of its output to the railroads and 74.06 per cent on the commercial market. Retail dealers took 54.63 per cent of the commercial tonnage and general industry —including the public utilities—45.37 per cent. Distribution on the basis of the entire tonnage sold by these particular producers was: Retail dealers, 40.46 per

cent; industrial consumers, 33.60 per cent; railroads, 25.94 per cent.

Southern Illinois producers have long recognized the value of salesmanship in print. Not for them the antique businesscard copy repeated until the battered type becomes undecipherable. Illustrations -color-copy that says something characterize most of the advertising sponsored by this group. Joe Leiter was one of the early trail-blazers when Franklin County was opened up in the early years of the century. Those who have followed have widened the path cut by the pioneers. Today southern Illinois probably is tops in the field of coal-trade advertising and sales promotion.

#### **Domestic Coals Stressed**

Because of the large rôle sales of domestic coal play in southern Illinois distribution, it is only natural that the bulk of the promotion material put out by the producers should be devoted to household fuel. Little, if anything, in the array of merchandising aids is missing from the combined promotion kit of the sales departments of the southern Illinois mines. This material ranges all the way from elaborate portfolios of direct-mail campaigns for retail dealers-a development pioneered in coal by southern Illinois-to simple, occasional mailing pieces or suggested newspaper advertisements.

Few campaign portfolios are without the ubiquitous blotters. Mailing cards to be sent by the retail merchant to his customers and prospects hold a prominent place. Letters imprinted with the dealer's name and address also are favored. Some companies handle the entire addressing and mailing from lists furnished them by their retail outlets. At least one producer supplements dealer direct-mail pieces with handbills for dealer distribution. These are 9x12-in. two-color jobs folded to 6x41 in, for delivery and a far cry from the newsprint handbills of an earlier day.

Local newspaper advertising to be run over the signature of the home-town retail coal dealer is emphasized in most of the producers' promotional campaigns. Mats of illustrations and also of complete ad-

### Table I—Commercial Shipments of Southern Illinois Coal 1: 1932-1939

			-					
То	1932 (Tons)	1933 (Tons)	1934 (Tons)	1935 (Tons)	1936 (Tons)	1937 (Tons)	1938 (Tons)	1939 (Tons)
Illinois 2	7,087,121	5,810,246	6,301,177	7,112,404	8,203,206	8,288,413	6,521,411	7,806,780
Iowa 3	856,332	828,900	868,301	1,032,350	1,275,842	1,208,530	954,695	957,870
Missouri 4	632,539	546,596	564,963	618,578	744,639	670,624	484,020	597,264
Minnesota	307,944	284,009	362,033	412,981	458,086	470,201	330,937	307.764
Wisconsin	307,848	403,400	666,278	1,028,419	1,073,724	1,065,480	916,788	1,115,992
Nebraska 5	174,527	118,890	135,341	155,762	161,225	136,060	93,561	90,783
South Dakota	93,487	76,220	98,567	117,208	130,215	118,730	95,558	92,520
Indiana 6	60,602	54,924	76,864	112,114	96,470	112,925	62,193	110,702
Tennessee	10,918	12,036	25,811	41,043	36,080	26,743	17,904	10,668
Michigan	4,196	5,615	21,669	37,390	38,069	35,869	22,301	73,786
Other States	45,871	37,426	53,821	71,839	81,900	61,941	47,433	65,564
Total	9,581,385	8,178,262	9,174,825	10,740,088	12,299,456	12,195,516	9,546,801	12,229,693

Includes Duquoin district.
 Includes St. Louis, Mo., and Davenport, Iowa; also Chicago Switching District points in Indiana.
 Exclusive of Council Bluffs and Davenport.
 Includes Atchison, Kansas City and Leavenworth, Kan.; excludes St. Louis.
 Includes Council Bluffs, Iowa.
 Excludes Indiana points in Chicago Switching District.





### SOUTHERN ILLINOIS' Model Mines

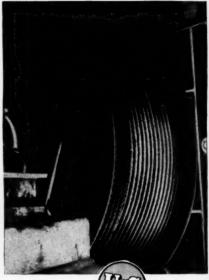
use these "model" products to boost output per man-day











If you were to visit the mechanized mines of Southern Illinois, you'd be impressed by the extent to which these mines rely on American Steel & Wire Company products. You'd find American Tiger Brand Wire Rope, in sizes from 4-in. boom ropes on huge electric stripping shovels, to small ½-in. operating ropes on compact mining machines. You'd find Amerclad Rubber-Sheathed Cables transmitting power to portable equipment, and a

wide variety of other types of electrical wires and cables in hundreds of types of service. You'd find Tigerweld Rail Bonds providing efficient, lowcost circuit completion.

Here in Southern Illinois, as in mechanized properties everywhere, operators prefer these products. Prefer them because they give longer service, because they eliminate needless delays, because they help produce more tons per man-day at lower cost.



AMERCIAD
RUBBER-SHEATHED CABLES
ELECTRICAL WIRES
AND CABLES
TIGERWELD RAIL BONDS
AERIAL TRAMWAYS



AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago and New York

For Anthracite Service: Miners Bank Building, Wilkes-Barre, Pa.

COLUMBIA STEEL COMPANY

San Francisco

United States Steel Export Company, New York

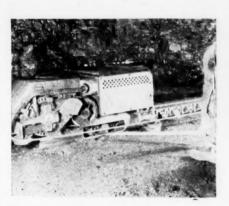
UNITED STATES STEEL

# WHAT'S NEW IN OPERATING IDEAS

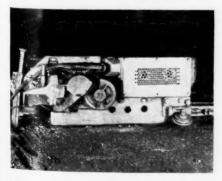
### Skid Guards on Shortwalls Prevent Leg Accidents

On the type of cutting machine illustrated with this article, according to John Lyons, safety engineer, Bell & Zoller Coal & Mining Co., Zeigler, Ill., there is normally on the right side of the machine an oblong hole having the dual purpose of letting cuttings out and allowing inspection of cutting-chain tension. This hole, which is near the bottom of the pan, presents a dangerous hazard when a skid is placed under the machine while the chain is in motion during sumping. There is extra danger if the skid happens to be bent because instead of going under, as intended, it is likely to enter the hole and be violently thrown around by the cutter chain, with disastrous results to the operator's leg or legs.

Although safety rules prohibit placing these skids while the cutter chain is in motion, the electrical repair department of the Zeigler mines has tried several methods of guarding the hole to prevent skids entering, the object being to make the operation foolproof. Swinging doors and rods criss-



With the hole open, placing the skid was a dangerous operation unless the cutter chain was stopped.



With a plate welded over the hole and three inspection holes properly placed, the hazard is eliminated.

crossed and welded over have been tried. Those types did not last long because the doors would be broken off while loading or unloading from the truck and the rods would be torn out by the drag of the chain bits.

A new method which has overcome the weakness of the former safeguards is shown in an accompanying illustration. Welded flush with the pan is a ½-in. plate. Three 2½-in. holes drilled with their centers in the line of the upper weld permit checking chain tension with a bit wrench. The new arrangement requires that more cuttings be shoveled by the helper but it does prevent broken legs.

### Shelves on Kathleen Stoppings Filled With Rock Dust

In addition to other rock-dusting work, shelves are built on stoppings in the Kathleen mine of the Union Colliery Co., Dowell,



The shelf on this stopping is filled with rock dust.

Ill., for rock-dust storage in case of emergency. A typical installation is shown in the accompanying illustration. Thus, in case the stopping is destroyed, the rock dust is thrown into the air to help in quenching or preventing an explosion.

### Positive Coupling of Cars Aided by Inverted Hook

Use of an inverted hook as shown in an accompanying illustration has materially simplified the car-coupling question at Majestic No. 14 mine of the Peabody Coal Co., DuQuoin, Ill. Developed by mine officials, the hook makes coupling much easier, as it is only a matter of dropping it in the end link on the next car. Furthermore, accidental uncoupling is practically eliminated, even



The inverted hook always stays coupled

when cars are bumped, as the hook merely drops down, still holding on to the chain link ready to take up its duties once more when the trip is stretched out.

### Stepping Under the Wheels Prevented by Guard

Getting on and off a locomotive while it is in motion is against the rules at mines of the Old Ben Coal Corporation, but, with a full recognition of human frailties, all cable-reel locomotives in Old Ben No. 11, Coello, Ill., are being equipped with guards which prevent catching a foot under a wheel unless a man is down flat. The illustration shows a G. E. 6-ton locomotive with the new guard.

The unit is termed a "safety step and wheel guard," and is wide enough to give



Combination wheel guard and wide step with safety flange.

# In Illinois as One of a fleet of Joy rubber-tired shuttle-cars, equipped with Exide translated. Satteries, serving the translated No. 20 mine of the Consolidated Coal Co. at the present times. One of a large fleet of Joy rubber-tired shuttle-cars, equipped with Exide-tronslad shuttle-cars, en its way to transfer conveyor at Batteries, on its way to transfer conveyor the Peabody Harrisburg No. 43 mine of the Peabody Coal Co. Coal Co A 6-ton battery locomotive, equipped with an A 6-ton battery locomotive, equipped with an Exide-Ironclad Battery, in operation at the New Monarch mine of Consolidated Coal Co. A 5-ton gathering locomotive, powered with an Exide-Ironclad Battery, in the Royalton Ro. 7 mine of Consolidated Coal Co.

## throughout the U.S., EXIDE-IRONCLADS REDOMINATE MINE SERVICE

Lo Southern Illinois goes the credit for much of the pioneering in the development of mechanized mining. The experience of operators in this district with advanced techniques and with the newer forms of equipment has been so extensive that they are qualified to speak with authority on the subject of mechanization.

It is significant that leading operators in this district, employing various underground haulage methods adapted to the individual conditions, are well agreed on the kind of storage battery to use for utmost performance, dependability, and economy. In Illinois, as throughout the United States, Exide-Ironclads predominate in mine service.

Illustrated here are three different types of underground haulage equipment-a

rubber-tired tractor-trailer unit, rubber-tired shuttlecars, and storage battery locomotives—as used in five different Southern Illinois mines. In each case, Exide-Ironclad Batteries are the motive power.

Exide-Ironclads have the high power ability and sustained voltage for fast haulage of heavy loads. They have the ruggedness and dependability to give years of trouble-free service. These advantages are so widely recognized that more Exide-Ironclads are used underground than all other batteries combined. Write for new, free booklet, "Mine Haulage on Rubber Tires."

THE ELECTRIC STORAGE BATTERY CO., Philadelphia The World's Largest Manufacturers of Storage Batteries for Every Purpose Exide Batteries of Canada, Limited, Toronto



Batteries recharged.

With Exide MIPOR Separators

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plenty of room for a foot. A flange on the side is carried nearly to the center of the wheel, so that getting toes mashed by a misstep is a practical impossibility.

### Box on Top of Locomotive Adds to Sand Capacity

To increase the capacity of the sanding equipment on the haulage locomotives at Old Ben No. 14 mine of the Old Ben Coal Corporation, Buckner, Ill., rectangular boxes have been installed on the locomotive tops as shown in the accompanying illustration.



This box with split hinged cover increases locomotive sanding capacity.

Pipe outlets in either end of the boxes fit the filling holes in the regular locomotive sand boxes and thus add materially to sanding capacity, at the same time reducing the number of stops for filling. The cover, as shown in the accompanying illustration, is split and hinged on each side for filling.

### Water-Spray Road Patrol Keeps Down Dust

Dust hazard on the main haulage road at Burning Star mine, Truax-Traer Coal Co., Elkville, Ill., is eliminated by sprinkling through the medium of a 1,600-gal. tank truck which continuously traverses the road during the working shift. Spray volume is such that the road surface does not become slippery but rather is wetted just enough to keep down dust. The company also feels that continuous wetting helps to maintain the road surface. Round-trip haul is from 6 to 7 miles.



This 1,600-gal. spray tank keeps dust down.

### Redesigned Locomotive Bumper Prevents Jamming Hitchings

Difficulty frequently experienced with locomotives bumping cars in such fashion as to cause hitchings to jam and bend or break the drawbar U on mine cars at Zeigler No. 2 mine, Bell & Zoller Coal & Mining Co.,



Truly hot—welding to revise this bumper had just been completed when this picture was snapped.

Zeigler, Ill., was remedied by redesigning the locomotive bumpers. Such a bumper is shown in the accompanying illustration. All that was necessary was to build the bumper out 3% in. on each side of a center space left for the hitching. With this revision, the bumpers on locomotive and car engage before the hitching can jam.

### Refuse Screened Before Crushing In Rotary-Type Unit

Refuse from the secondary elevator on the washer at Majestic No. 14 mine of the Peabody Coal Co., DuQuoin, Ill., is screened in the small rotary, or trommel-type, screen shown in the accompanying illustration. This screen is driven from the same drive as the refuse elevator. The round-hole



Material through the screen perforations is rejected; material out the end is crushed and recirculated to the washer.

### 20th Roundup

Supplementing the feature articles on southern Illinois mechanical mines in this issue—the Twentieth Annual Model Mining Number of Coal Age-the Operating Ideas section this month is devoted to cost-cutting safety-promoting kinks from southern Illinois operations. These are many and varied and will repay study by operating, electrical, mechanical and safety men in all mining districts. Next month, we return to our usual program of presenting ideas from all over. If you have such a kink, here is the place for it. So send it in, with a sketch or photo if it will help to make it clearer. Acceptable ideas are paid for at the rate of \$5 or more each upon publication.

perforations have a diameter of 2 in. Material through the perforations is rejected, while material discharged at the end of the screen (plus 2-in.) is run to a crusher for reduction to minus 2 in. and recirculation to the washer to recover the coal.

### Jig Cuts Time and Cost Renewing Tread Links

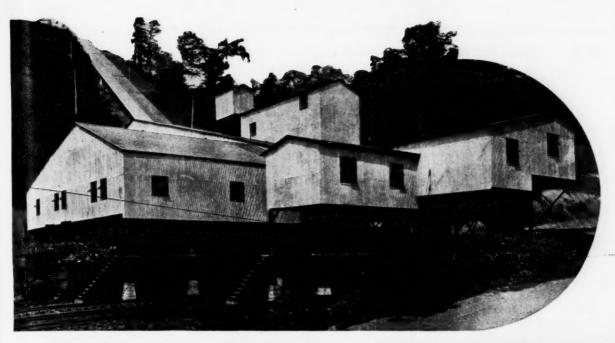
Loading-machine repair and maintenance men Frank Wisniewski and A. D. Weaver, Mine No. 2, Bell & Zoller Coal & Mining Co., Zeigler, Ill., have devised a jig to cut time and cost of renewing worn Joy caterpillar tread links, or "cat shoes," as they are locally called. Originally a sample jig was made which clamped the shoe in position, but the method of clamping was too slow



Clamp opened to show construction. Templet for boring the holes is in place.

and the new arrangement was worked out in such a way as to align the shoes so that the holes could be rebored accurately.

A removable templet having the holes properly spaced was made with dowel pins to locate it on the jig and eliminate any possibility of the templet slipping. The next



### **MORROW-IZE to MODERNIZE**

your Coal Preparation
Equipment

Representative types of Morrow Perforated Screens.

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Today's specialized coal markets require constant atten-tion to sizing and preparation. Here's a typical example of lump coal sized and prepared with Morrow Equipment.

MORROW engineers provide the ready solution to any modernization or alteration plans you may have under consideration. Any change from the smallest addition to a complete mine tipple installation is given personalized, individual attention by Morrow . . . and many installations are made without disrupting in any way your production schedules.

Modern, highly efficient shaking and vibrating screens, picking tables, hoppers, conveyors, rotary dumps, chutes, loading booms, crushers, dryers, recirculators, washers and numerous other essential coal preparation equipment is individually adapted by Morrow to your particular needs and present equipment.



Morrow-Prins Multi-Flow Coal Washer, recognized as America's most flexible coal preparation unit.

Morrow's complete designing, engineering and manufacturing facilities are constantly at your service. Remember! Morrow-ize to Modernize.

Morrow Screening Unit for Truck Mines and Retail Coal Yards.

October, 1940 - COAL AGE

Modernize with

WELLSTON, OHIO MANUFACTURING CO. DESIGNERS AND BUILDERS OF COAL HANDLING EQUIPMENT FOR OVER 25 YEARS

### MODEL MINES USE MODERN METHODS . . . So it's CINCINNATI CUTTER CHAINS Southern Illinois

 Southern Illinois—a center of modern mechanical mining methods —has pioneered in the use of mining machines since the early 20's, so it's a certain recommendation of quality when they choose Cincinnati Cutter Chains and Bits for their high-production cutting machines. Obviously, these South-ern Illinois operators have found that the efficiency, economy and ability of Cincinnati Chains to stand up under the severest operating condition mean profits for them from all coal cutting activi-

So, let's take the newest Cincinnati Cutter Chain (shown above) and see why it's superior. Every proven feature of former Cincinnati Chains has been built into this unit. Of primary interest is the new joint construction. It takes the brunt of the wear and when, after a period of strenuous use, the chain loses its perfect pitch, you can in-expensively renew the joint and the pitch of the chain will be perfect again. It's simple, yet it's practical to the extent of appreciably lowering coal-cutting costs. Be modern . . . make each of your operations model mines . . . choose the new Cincinnati Cutter Chain. A letter to us will bring complete details-

THE NEW CINCINNATI JOINT LASTS LONGER AND HERE'S WHY!!



This rivet holds the bearing pin against longitudinal displacement—easy to remove and replace.



The bearing pin is rigidly locked in the block by the flat on one



THE CINCINNATI MINE MACHINERY CO.

\* Spring Grove & Meeker Sts.

Cincinnati, Ohio \*

nector

inserts give fresh from -the - factory

joint accu-racy to a worn con-

### ADDITIONAL COPIES AVAILABLE

of "130 Cues to Coal-Mining Profits" which was a supplement to April Coal Age

This chart for study and ready reference wall or desk display shows production for both anthracite and bituminous coal, breakdown of cost per ton of bituminous by regions, amount of mechanically loaded bituminous tonnage and number of units which have been installed, together with the growth of mechanical cleaning in the bituminous industry. "130 Cues to Coal-Mining Profits" also consists of a series of questions to stimulate thought as to the best methods to use in every coal-mining phase from new construction work on through all underground and strip work to preparation-plant practice and refuse disposal.



Showing shoe clamped for counterboring.

and most important problem was that of eliminating lost time in clamping the shoes. After experimenting with various clamps, one on the cam principle, with a spring in the body, was found to supply the proper tension. When closed, the cam tightens the clamp and stays in position until opened manually.

In operation one hole is drilled through both walls of each shoe with the templet in place. This hole is 16 in. in diameter. The jig then is moved into alignment and the second hole is drilled through both walls to complete this operation. The templet then is taken off, one hole counterbored and the shoe is reversed for counterboring the hole on the opposite side. When all the shoes are counterbored the jig again is shifted and remaining holes counterbored. This involves four operations, not counting the welding of the holes and the dressing of the welded shoes. With the old jig one man could finish about 15 shoes in seven hours, but with this arrangement he can finish about 90 shoes in the same time.

For rebuilding the worn holes, a 36-in. mild-steel "shielded-arc" electrode is used. This is about as large a rod as can be used without melting and deforming the shoe wall. The counterbore is a Morse 1,000x 0.562-in. drill.

### Chain Guard Quickly Repaired With Renewable Piece

If a front conveyor chain breaks on a 260-A loading machine in the mines of the Old Ben Coal Corporation, in southern Illinois, the damage to the chain guard now is quickly repaired at a cost of \$17.50, compared with \$110 and a much greater delay in the old days. This is accomplished by cutting the ends off the original cast-steel guards and fitting them to renewable pieces made from low-grade cast iron designed to break easily if strained by a broken and iammed chain.

An old guard which has been bent hopelessly out of shape by a chain break is shown in the accompanying illustration. Beside it is one of the cast-iron ends which is fitted to present guards after cutting that much of the curve off the ends. When the



Renewable end beside a ruined guard of the original type.

illustration was made, twelve of the 260-A machines already had been equipped with the renewable part, while work on the remaining fourteen was in progress.

### Guards Protect Swing Jacks In Shuttle-Car Work

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Swing jacks for the rear conveyors of 14BU low-pedestal loading machines working with shuttle cars at the Harco No. 47 mine of the Peabody Coal Co., Harco, Ill., were being damaged in the past by being bumped against the sides of the shuttle cars. This difficulty has been eliminated by adding a guard to the side of the rear conveyor. Construction of the guard is





The jack is guarded so that bumping the shuttle car will do no damage. The guard has two "cat-eye" reflectors on the back end

shown in one of the accompanying illustrations. Fabrication is by arc-welding but the guard is bolted to the conveyor so that it can be taken off easily for maintenance of the jack and sheave.

Reflector buttons were installed on the rear of the guards as shown in another of the illustrations herewith. These are a material help to a motorman when the loaders are being serviced with mine cars, as he can see the conveyor that much more easily.

### Chains in Dragline Buckets Facilitate Cleaning

Several of the stripping operations in southern Illinois which employ large draglines have equipped the buckets with chains to assist in clearing them when dumping,



The chains help the bucket clear itself.

particularly when the material handled is inclined to be sticky. An example of such a chain installation, at the Burning Star mine of the Truax-Traer Coal Co., Elkville, Ill., is shown in an accompanying illustration.

### Rear Conveyors Strengthened By Adding Flanges

When rear conveyors for 11BU loaders are rebuilt in the top shop at Zeigler No. 2 mine, Bell & Zoller Coal & Mining Co., Zeigler, Ill., flanges are added to the side plates as shown in an accompanying illus-



A flange is welded to the top and run down around the end onto the bottom of the conveyor to prevent bending.



# HAUL AWAY THE TONNAGE BUT LEAVE THE Profits BEHIND

Profits roll away or complaints return to plague the colliery where weighing equipment is permitted to lapse into costly inaccuracy. It will not obligate you to send for a trained Howe Scale representative. He will gladly furnish facts and figures on long-lived, low cost records of service by different types of Howe Scales in the mining field, submit recommendations for controlling your costs and safeguarding your profits.

### HOWE

MINE SCALES

AND WEIGHTOGRAPHS
FAMOUS FIRST IN 1857



Write today for new folder "Howe Scales for Every Weighing Purpose." The Howe Scale Co., 103 Scale Avenue, Rutland, Vermont.

### LONGER LIFE at LOW COST

for mine ties and timbers both below and above ground!



This photo shows the incline at Clover Eplint Coal Company mine at Closplint, Ky., where the track was recently rejuvenated with 800-6"x8"x7' Osmose-treated oak ties, used to replace other ties which had failed in service prematurely because of decay.

## OSMOSE NATURAL PRESSURE TREATMENT

is being used by leading mine operators to secure 3 to 5 times longer life for mine ties and timbers, both above and below ground, than can be secured from untreated wood. Write for detailed information.

### OSMOSE WOOD PRESERVING CO.

of America, Inc.

General Offices:
1437 Bailey Ave., Buffalo, N. Y.
Branch Offices: Martin Bldg., Birmingham, Ala.; Ernest & Cranmer Bldg.,
Denver, Colo.; Bell Bldg., Harlan, Ky.



This welding jig is left on the conveyor until it arrives at the loader.

tration. These flanges prevent bending of the conveyor, which might result in jamming the chain, and consist of a ½ x 3-in. bar curved around the end. A pocket for a tail light is built into the curve on the end of the conveyor on the operator's side, and the bulb is supported in a weatherproof socket mounted on a square of ½-in. rubber belting.

A welding and transporting jig used on the other end of the same rear conveyor is shown in the second of the accompanying illustrations. This jig consists of two cylinders and a 1½-in. bolt with heavy washers, and holds the parts in exact position while welding top plate and lower casting. By leaving the jig on the conveyor, which is a spare unit, until it has been taken underground to the loader, the chances of damaging the top plate by bending it in transit are eliminated.

### Adjustable Wheel Holder Facilitates Welding

Because with almost every overhaul of a truck for a battery locomotive at the Jefferson No. 20 mine of the Consolidated Coal Co., Nason, Ill., it is necessary to take the wheels off to renew the reduction gearing,



Wheel tilted to show position used when flange welding is begun.

these wheels are welded off the axles. To facilitate depositing metal when building up the flanges of the steel wheels, the adjustable wheel holder shown in the accompanying illustration was built a short time ago.

For welding the tread the axle is adjusted to a horizontal position. As welding of the flange is begun, the wheel is tilted to the correct angle for gravity to aid, rather than hinder, deposition of the bead.

### Safety Shotfiring Attachment Placed on Lamp Battery

Firing of shots at the Harrisburg No. 43 mine of the Peabody Coal Co., Harrisburg, Ill., is done from cap-lamp batteries fitted with special receptacles with hinged covers developed at the mine. These receptacles



Showing receptacle on top of the battery case with the cover closed.



Showing how the tapered plug is placed in the V-shaped receptacle, where it must be held in contact, and falls out immediately upon release.

take special plugs on the ends of the shotfiring cables, and the design of the plugs and receptacles is such that a plug cannot remain in place in the receptacle without being held in by the hand. Consequently, there is no possibility of a plug inadvertently being left in place while shots are being wired up. The cover, which drops down, is



### **Goodrich CORD Conveyor Belt**

bas 4 times greater impact resistance, often increases belt life 2 or more times

Ply separation unknown, flexing failure eliminated, troughs perfectly, almost stretchless

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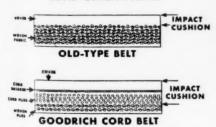
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DUE to an entirely new principle of construction, developed by Goodrich engineers, many mines can now double conveyor belt life at no greater initial cost. Where failure has been caused by impact, this Goodrich construction may increase your belt life as much as 10 times. A look at these features will show you why:

Cord Construction



Instead of woven plies throughout, all plies except those nearest the pulley are of parallel

anti-stretch cords surrounded by rubber which forms a connected mass. These plies have practically the same impact resistance as the cover. Since resistance to impact increases as the square of the increase in cover thickness a Goodrich Cord Conveyor Belt of average thickness gives 4 or more times the impact resistance of the former woven ply construction.

This explains why a Goodrich Cord Belt has already carried 2,700,000 tons on a severe installation where the best previous belt failed at 400,000 tons.

Transverse Cord Breaker



This is a ply, between cover and cord plies, of *transverse* cords, each insulated by rubber. This ply distributes impact shock. The cord

breaker also increases adhesion of cover to carcass at least 50% and prevents what is probably the greatest cause of belt failure—distortion of rubber cover beyond its elastic limit.

Other Important Advantages

Ply separation is unknown because the rubber through which the parallel cords run is one connected mass—there are no plies which can separate.

Because each cord is entirely surrounded by rubber, flexibility of the Goodrich Cord Belt is increased many times and failure from flexing is virtually eliminated.

Perfect troughing is assured, full or empty, because of the great transverse flexibility due to the cord plies running in the direction of travel.

Metal fasteners can be used in many installations, but the Goodrich method of field splicing is so simple and increases belt life so much that most users naturally employ it.

Long, Successful Experience

Goodrich Cord Conveyor Belts have been on many test installations, in mines, tipples and loading docks, since 1932. In every one they have shown important increases in service, substantial reductions in conveying costper-ton. Write for full information today. This improved belt may easily be the means of drastic cuts in belting costs for you, too. The B. F. Goodrich Company, Mechanical Rubber Goods Division, Akron, Ohio.

## Goodrich CORD CONVEYOR BELTS

(Another story of Goodrich development appears on pages 1 and 203)

### Most Southern Illinois Shaft Mines Are Using

### GEMCO TRU- TOOLS

To Prevent Accidents and Shutdowns

A few of the many who thus save Time, Labor and Repairs:— BELL & ZOLLER COAL CO.

CONSOLIDATED COAL CO.

C. W. & F. COAL CO.

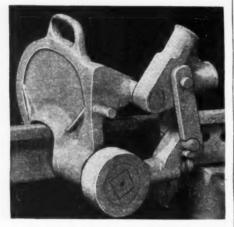
DELTA COAL MINING CO.

FRANKLIN COUNTY COAL CO.

OLD BEN COAL CORP'N SAHARA COAL COMPANY PEABODY COAL CORP.

UNION COLLIERY CO.
UNITED STATES FUEL CO.
VALIER COAL CO.
SEYMOUR COAL MINING CO.
SUPERIOR COAL CO.

WALLACE COAL CO.
WASSON COAL CO.



MULTIPLE LEVERAGE-RATCHET PUNCH Efficiency 3-1; saves two-thirds the effort required with any other portable punch on the market.



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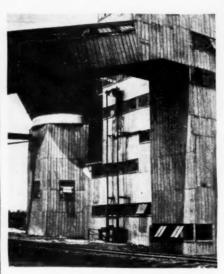
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an additional protection to the contacts.

The attachment with cover closed is shown in one of the accompanying illustrations. The other shows the plug, which consists of a tapered piece of wood with the contacts on the outside. The plug contacts engage corresponding contacts in the V-shaped receptacle. As can be seen, the plug must be held in with the hand to make contact and falls out immediately when released, thus breaking the contact.

### Materials Elevator Installed At Pyramid Plant

An elevator in open guides on the outside of the building for hoisting maintenance materials and parts is included in the facilities at the Pyramid preparation plant of the Pyramid Coal Corporation, Pinckneyville, Ill. The elevator guides at the plant, rated at 1,000 tons per hour, appear in one of the accompanying illustrations.



Guides for maintenance elevator are placed outside the building at Pyramid preparation plant.



Looking from the ground, the side of the preparation plant appears in the mirror. From the boom operator's station, however, the mirror shows the end of the egg boom.

For the convenience of the boom operator, a mirror is mounted on the A-frame at one end of the boom-hoist support. With this mirror, the operator can see the end of the egg loading boom when it is down in a low-sided car with a high-sided car next to it, which thus cuts off the direct view.

### Home-Made Friction Retarder Spots Railroad Cars

Railroad cars at Royalton No. 7 mine, Franklin County Coal Corporation, Herrin, Ill., are spotted for loading by a homemade car retarder operating on a third rail laid about 3½ ft. from the regular track rail. This rail (60-lb.) is mounted (using steel tie plates) on ties on 5-ft. centers extending to the center of the main track.



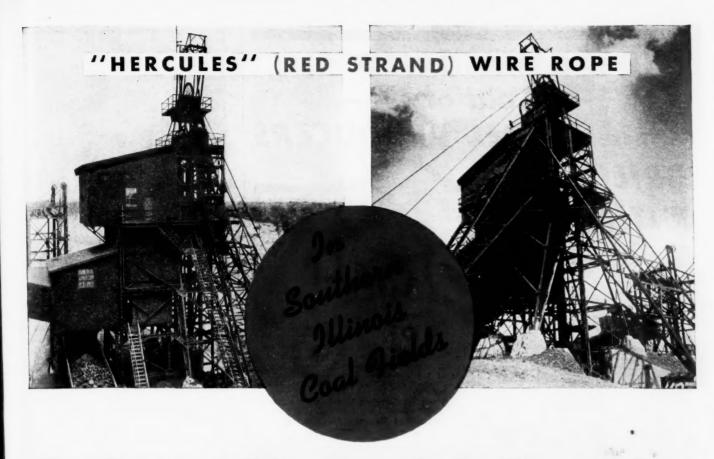
Railroad car being spotted with a homemade retarder.

The retarder consists of a steel casting which fits over the ball of the rail. To install it, it is slid on over the end of the rail. A steel friction plate fitted into the casting and bearing on the surface of the rail serves as the retarding medium. Pressure is exerted on the friction plate by an eccentric on the end of the operating lever. A 10-ft-long chain extends from the retarder to the car.

### Remotely Actuated Car Counter Helps Kathleen Dispatcher

A remotely actuated car counter has been built by the dispatcher and chief electrician at the Kathleen mine of the Union Colliery Co., Dowell, Ill., for giving the former a record of the number of cars before the trip passes his station at the entrance to the main bottom. The counter is operated by a rail treadle sufficiently long so that a mine car depresses it but once, while a locomotive, with its longer wheelbase, depresses if twice.

An electro-magnet, as shown in the accompanying illustration, pulls down an armature which rotates the spur wheel one notch for each depression of the treadle. On the



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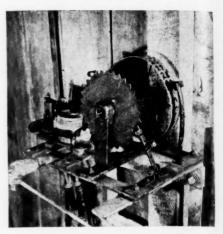
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- 5. Present type of auger shank .......
- 6. Present style of drill head and bit ...... make ...... style no...... 7. Objections to present drilling tools .....
- 8. We are drilling Coal, Clay, Shale, Slate ...... It is easy, medium, hard; dry, damp, wet; pure, ..... bands, streaks. Drillings break, chip, pulverize, choke, stick. Other characteristics

Name ..... Title .....

Location



This car counter is remotely actuated by cars passing over a treadle.

rim of a wheel on the same shaft a succession of numbers from 1 to 30 is painted. As the wheel rotates to count the cars it winds up a spring. After the trip passes, the dispatcher trips a pawl and the wheel is returned to zero by the spring. As the operation of the magnet can be plainly heard, the dispatcher can count the number of cars without watching the wheel, if he

### Special Sleeves Protect Shovel Hoist Ropes

Life of the hoist ropes on the stripping unit at Burning Star mine, Truax-Traer Coal Co., Elkville, Ill., has been increased materially by the use of special rubber sleeves just above the padlock sheaves. Thus, when the dipper is in the bank, the hoist ropes are protected from being cut by rocks and worn by being pulled through bank material. The sheaves also are equipped with special guards which prevent the ropes from jumping out of the grooves and jamming in between the sheaves and the housings.



The rubber sleeves just above the padlock sheaves protect the hoist ropes.



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# NEW LIGHT ON OLD QUESTIONS

### How Can We Reduce Our High Fatality Rates From Roof, Face and Side Falls?\*

By JOHN E. JONES

Safety Engineer, Old Ben Coal Corporation, Benton, Ill.

TOO LITTLE has been done to cut fatality rates from falls. As suggested in the previous article, a better understanding of the best methods of roof sounding might do much to decrease the frequency of such accidents. Reference has been made to sound and drummy roof and to roof with highly inclined and vertical crevices that give no indication of unsoundness to the diligent tapper. But there are other conditions which are equally disturbing, such as clod roof, which is shown in Fig. 1.

Roof of this type does not ring nor give a drummy sound. Rather, it yields a dull thud, though occasionally, by tapping, some estimate of its thickness may be made. This sketch illustrates a frequent hazard, for the clod near the pillar is thin and over the center of the room or heading is quite heavy. The clod, it is true, forms a sort of beam, but the strength of it at A and B is insufficient to support the weight of the clod between these points.

In Fig. 2 is shown a type of hazard frequently met and one that cannot be tested readily by sounding. A heavy scale of rock already has fallen from the roof, and a prop on the left side has been set at a point where the rock, on testing, has emitted a drummy sound. At A, the sound was merely a thud, and the rock was regarded as not being loose because sounds at B, C and D appeared to prove the rock to be nearly or entirely solid.

This apparent solidity at B, C and D was not because there was no risk of a fall but because the back surface was angled or the rock beneath it was too thick for the sound to be registered as drummy. But at E the thud sound once again was manifested. So the indications at B, C and D are misleading, and the loading out of the fall is likely to be commenced without the needful setting of temporary props, though permanent props will be set after the fall has been loaded into cars.

Indications of weakness having been demonstrated on either side of the heading or room, it would be advisable to assume that the condition exists all the way across the opening, as is shown in the illustration. The thud sounds at A and E are suggestions that

the looseness was not confined to the areas near the coal pillar but existed from the post, on the left, to the rib, on the right.

In Fig. 2 also is a loose brow lying between arrows F and G. Sounding with a horizontal blow at F is like sounding with a vertical blow at A in Fig. 4 in the previous article, for the blow is directed parallel to the bedding plane, whereas in Fig. 4 it parallels the slip. In either case it is parallel to the cavity. When sounding vertically at G, the loose brow  $F \cdot G$  is so tightly up against the rock above it that the sound is rather a thud than a solid roof ring, but the man sounding the rock may not make the distinction and believe the brow to be safe.

Boulders-or perhaps they should be termed "concretions"-are shown in Fig. 3.

Soundings here are of no value, for the cavities and back rocks will not give a drummy sound, yet boulder A will fall as soon as a little more coal is removed. The crevices are curved, and the resonant waves accordingly are distorted. Boulders B and C will sound solid even though loose.

In the kettle bottoms, or fossilized tree roots, a horizontal cavity at a may cause the sound to be drummy, depending upon the smoothness of the cavity and its closeness to the point of sounding. The rough coal break in Fig. 3 shows a large chunk of the rib ready to fall. Despite the presence of the cavity, sounding the coal rib will not give a drummy vibration because of the roughness of the inner surface. Feeling for vibration will better indicate the hazard.

Miners usually have a fair conception of the thickness of a separating pillar when blows are made on one side of it to guide someone listening on the other side. A solid place in the coal should be chosen for rapping, and the ear of the listener should be held close up to the face so that the vibration will not have to pass an air gap but go direct to the diaphragm of the ear or pass through the bones of the body to the man's sensory organs.

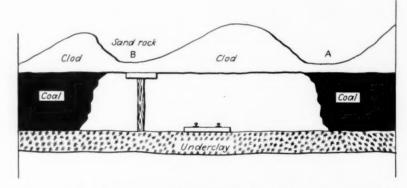


Fig. I—Another treacherous roof that fails to give a drummy sound; instead it usually produces a thud. The rock at A and B is too weak to sustain the rock that lies between those points.

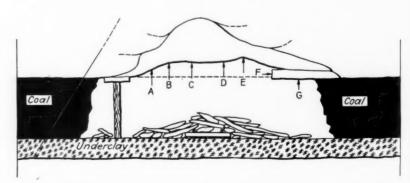


Fig. 2—This hazardous roof may not give a drummy sound because of slope of crevice, its distance from the blow struck or the close contact between uncemented rocks.

<sup>•</sup> Second of two articles on roof sounding. First article appeared in September issue, p. 62. These articles and a third to follow embody Roof Hazard Committee's report to the Illinois Mining Institute (J. E. Jones, chairman), recently published by the institute as "Mine Roof, Face and Ribs."

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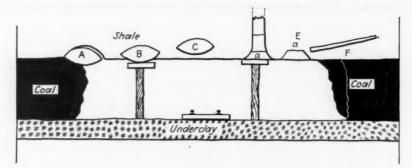


Fig. 3—Concretions like A, B and C do not give a drummy sound even when loose. A flat cavity as at E is required for resonance.

Blasting can be heard at much greater distances than hammer blows on the coal, and a geophone can detect sound waves at much greater distances than the unaided human ear and will give a sense of direction also. Unfortunately, the practical development of the latter instrument has not been completed but a sufficient technical advance has been made to show the possibility of success.

When listening on the surface of the ground with the geophone to rappings of miners underground, the sound, wherever measures are level, passes across the laminations. Vibration tones and velocities obtained from the sounding of coal in line with the bedding planes are entirely different from those derived from the sounding of coal at right angles to these planes. The differences are similar to those in sounding prop or crossbar, lengthwise or crosswise. Sound waves travel along the grain of elm wood at 13,517 ft. per second and across the grain at only 4,658 ft. per second.

#### Must Remember Roof Sounds

If, in sounding, it was possible to have standard sounds for a comparison, greater certainty would result, but the man making the tests has to depend on his tonal memory. The singer uses a tuning fork when he does not desire to rely on his recollection of tone. but probably the best that can be done in a mine is to make tests frequently where conditions are known so that they can be recalled when testing in some other place where the conditions are not known. Often, when I have found a man who could not distinguish a thud sound from a solid tone, I have had him reverse his pick and strike with the handle. By eliminating the ring of the metal pick the difference between the sounds becomes more apparent.

In analyzing the sound emitted by a tapped rock, failure most frequently occurs from mistaking a thud sound as one indicative of a solid piece of roof. So long as a drummy sound is absent and the ring of the pick is the predominating sound, the sounder is satisfied that nothing need be feared. He knows that when the roof is drummy he takes his life in his hands if he works under it, but when the sound it gives is a thud he may regard it as an "all-clear" sign and will work under the roof with an assurance not justified by the indication.

When an anvil is struck with a steel hammer, sounds from both anvil and hammer are heard. In sounding rock and coal, a tool should be chosen that will produce by its own vibration a minimum of sound, so

as to emphasize the sound from the vibrations of the roof. A baseball bat, a billiard cue or a copper rod, which vibrate relatively soundlessly, would be ideal in this respect, but for the miner they would be special equipment. He usually has only a steel bar, a shovel, a pick and a 3- to 4-lb, hammer, Of these the best is the bar or the hammer. More general use of the latter should prevent many accidents from falls.

Many tests can be made at home that will throw light on roof sounds. If the upper surface of a flat table is rapped, it will be noted that near a table leg the sound will suggest solidity, but, as the rapping is extended to points at a distance therefrom, the sound will appear drummy. If a pane of glass is placed over the same area and the glass lies quite flat against the table top, the sounds will be quite similar to those when the glass was not there, for there is no air space between glass and table and therefore no air vibrations to transfer and modify the sound. Nor does the addition of another pane of glass change the sounds, for again there is close contact and no intervening air.

From this, one becomes impressed with the hazards of drawslate. If the laminas of rock, like the plates of glass, are in contact without the interposition of air, there will be no drumminess, and the roof will appear safe. A close contact between rock surfaces will make the formation of the drummy sound impossible, but it will not insure safety.

#### Separation Creates Drumminess

However, if the two panes of glass are separated by 2-in. cardboard strips, making a closed air space between them, the drummy sound on rapping at once will be perceived. With an 18-in. length of clothesline, areas of various sizes-round, elongated, open or wedge-shaped-can be devised and many different sounds be made and

On close search, vertical roof breaks sometimes may be found in mine workings, but, for reasons that have been explained, sounding will not give evidence of the existence of such breaks. A freshly chipped surface made by the weight of a big rock, however, may be evidence of a severe hazard that sounding will not reveal, for the rock is too big to bend and disclose the weakness that lurks behind its upper surface. sionally, the chipped edge can be located by noting the fresh shale chippings that have fallen on the floor. On rare occasions, moisture will appear along the invisible crevice where the break will soon occur.

More important than the length of experience of a miner is his ability to recognize danger, to avoid it or guard himself against it, though the factor of chance cannot be overlooked. In Illinois, of 209 men killed in five years (1924-1928 inclusive) by rockfalls of roofs and brows and of 121 men killed in that same time by coal falls from face, rib and roof, 159 of the roof-fall accidents and 81 of the coal-fall accidents befell men between 35 and 74 years of age. Judging by their ages, they surely did not lack experience. With time, many mine workers and bosses either cease to learn anything further about the means of avoiding roof-and-sides danger or become careand indifferent to it and so offset their Eperience.

### Mine Air Often Whirls Around Like a Kansas Tornado

Air in the mines does not travel in a straight line unless the floor, sides and roof are smooth, straight and of regular cross-section. Usually, with the speeds of air in mine ventilation, there is much The air forms vortexes, or turbulence. whirls, so that part of the air, like water in a stream, may form a sort of aerial whirlpool. Revolutions of this kind may often be noted on the surface of the ground where wind raises dust, leaves and paper. Because in the dark of the mine the phenomenon cannot be noted is no reason to doubt its existence. Part of the air will be going back and part across the roadway. Though started probably in a different manner, the whirling air will act in a degree like a hurricane which moves forward at a speed of 10 to 20 mile. an hour with the air revolving around a center at 75 or more miles per hour, though, of course, the air in the mine will not whirl around at any such speed.

Obstructions, such as posts, crossbars. fallen rock, or spaces where it has fallen. gob, cars, locomotives, animals and men traversing the airway cause the air to start whirling. Changes of cross-section at crosscuts is another cause for such rotatory movements. Room necks also cause such whirls, especially where air is entering or leaving them. Air in the mine seldom travels in a straight path.

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This is a fact that it is well to remember, for if auxiliary ventilation with a small blower fan is put near the mouth of the place to be ventilated, vortexes may form, and the air may travel back as well as forward, somewhat like a corkscrew set vertically, and the air which has already been circulated by the blower may be whisked into the fan and pipe to go back into the room, carrying its methane and carbon dioxide with it.

But that is not the only influence causing recirculation, for the low pressure of the air entering the fan will even more powerfully bring about that result. For these reasons, the authorities urge that blower fans, where used, be placed well back from the mouth of the places to be ventilated, especially if the air on entering the place cannot return to the airway in any other way than by the neck or other opening by which it entered.



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### **QUESTIONS** ASKED BY STATE BOARDS

### Mine Foremen's Examination—Iowa June 11-12, 1940

No official answers have been provided for these problems and questions and those given are therefore unofficial.

#### Mine Gases

P.—Give chemical symbol, specific weight or gravity and characteristics of blackdamp, whitedamp and stinkdamp.

A.-Opinions differ as to whether the names of these damps should be considered as designating simple chemical compounds or actual mine atmospheres. Thus some sav blackdamp is carbon dioxide mixed with air lacking in the normal quantity of oxygen. However, it seems general practice in the United States to interpret these damps as representing simple chemical compounds; thus blackdamp is carbon dioxide, whitedamp is carbon monoxide, and stinkdamp is hydrogen sulphide. The question in itself indicates that this is what the examiners had in mind, for otherwise it would be impossible to give chemical symbol or specific weight of such variant mixtures of gases. is extinguished by the gas, the wearer of the lamp should remove to better air.

Carbon monoxide has about the same specific gravity as air and therefore tends to distribute itself through the mine atmosphere more readily than carbon dioxide; it is combustible, burning to carbon dioxide, colorless, odorless, tasteless. It is not contained in a natural atmosphere and its occurrence in the mine is considered a sure sign of the presence of a fire or the outcome of a mine explosion, though it is known now that certain bacteria will remove carbon monoxide, so absence of that gas does not show that a fire does not exist or has not existed. Carbon monoxide is very poisonous, combining with the hemoglobin of the blood, so that the blood carries carbon monoxide to the tissues and a decreased quantity of oxygen. This gas is made by explosives when they are imperfectly detonated.

Hydrogen sulphide is colorless, has a sweetish taste and a distinctive odor of rotten eggs, so that even 0.1 per cent can be detected by the nose; it is more poisonintake side, so that the noxious gases from the fire would not travel toward me. On this side. I should be able to get closer to the fire than on the return side.

Whether the fire has to be sealed or fought by direct methods, no more air should pass over it than will be necessary to establish the travel of the air in a dennite direction so that neither the gaseous products of the fire nor the heated air will make work on the intake difficult and so that explosive gases will be removed as emitted or formed. To do this, much of the air should be shortcircuited by breaking down a stopping near the point at which the fire is to be sealed and regulating the air flow at that point.

Though no census of technical opinion has been taken, authorities seem to favor sealing the return first, using oxygen-breathing apparatus. When that has been done, the carbon dioxide will be unable to escape and will blanket the blaze. But some would seal the intake first, and they may be right. Others would close both intake and return at the same time. In a gassy mine, some advocate building both stoppings so as to finish them both at the same instant. Possibly any of the plans outlined will be about

equally safe and effective.

In a gassy mine, some prefer to close in a large area so that the gas percentage will be longer in reaching a dangerous figure, for the evolution of gas is greatest near the fire and the further any sealed portion is away from the fire, the less methane it will emit. Such larger area will have portions that are outside the direct return and will be relatively cool. The air behind the seals accordingly will be able to develop a temperature unfavorable to a continuance of combustion. Some have cooled off a mine fire by establishing a ventilating circuit within the sealed area, moving the non-combustible gases by a small fan installed behind one of the seals.

With a gassy mine, it is said also to be best to erect, as rapidly as may be, tight temporary wood brattices with men using oxygen-breathing apparatus and to leave the mine for 24 hours so as to give the atmosphere behind the seals time to explode

if it intends to do so.

If it explodes, the brattices can be replaced, with some probability that an atmosphere will form behind the seals so extinctive of active combustion that no further explosion will occur, this because when the explosion occurred the air behind the seals already was not fresh but vitiated by the return from the fire. If no explosion occurs it probably will be safe to erect another and more carefully built seal to the outby. In any event, it would seem that no safer method of erecting seals could be devised than that outlined.

If no breathing apparatus is available, a tight brattice will have to be erected in the first instance on the intake followed by an other equally tight on the return.

Popular name Chemical name Chemical symbol Specific weight Specific weight Specific gravity

Blackdamp dioxide  $CO_2$ 0.12341
1.5291

Whitedamp Carbon monoxide CO 0.07805

Stinkdamp Hydric sulphide H<sub>2</sub>S 0.09614 1.1912

Specific weight is weight of a cu.ft. of the gas at 32 deg. F. when taken at sea level. Specific gravity is relation of these weights to the weight of air at the same temperature and pressure.

Carbon dioxide, being more than one-half heavier than air, is likely to be found near the floor of the mine and in the mine's lower workings. It is contained in all natural atmospheres, usually to the extent of 0.0336 per cent. It is non-combustible, colorless and odorless, has a slight acid taste, especially when dissolved in water, which solution readily occurs.

It is formed by the breathing of men and animals, the burning or explosion of coal, acetylene, gasoline, lubricating or illuminating oils, decay of wood or other vegetation and animal matter and is emitted by coal during its oxidation. Carbonates attacked by acid mine water may produce it, and it may escape from fissures in the coal.

How much carbon dioxide in the air will prevent a methane explosion or put out a light depends on the quantity of oxygen in the air. In a mixture containing 20 per cent of carbon dioxide, 19 per cent of oxygen, 6.4 per cent of methane and 54.6 per cent of nitrogen and other inert elemental gases, the methane will not explode. In a sense, carbon dioxide is not poisonous, but it is fatal to life nevertheless when present in sufficient quantity. When an open light ous even than carbon monoxide: 0.05 per cent will prove fatal if breathed for long; 0.07 will prove fatal in an hour and 0.20 per cent in a few minutes. It paralyzes the smelling organs when in high concentrations, so that when large quantities are present they cannot be detected by their smell. It is explosive, but, when present in quantities making it explosive, death would follow a whiff of it. This gas is made by the combustion of pyrite, so it always is present when coal is burning, also by decay of animal and vegetable substances containing sulphur, by action of sulphur bacteria on acid waters, by the burning or explosion of explosives if, like black powder, they contain sulphur, and by the heating of pyrite in coal by an explosion of powder. Giddiness, cold skin, labored breathing, irregular heart action and stomachic pains, sometimes followed by delirium, convulsions and lockjaw, result from exposure to this gas.

#### Sealing Mine Fires

Q.-How would you approach the burning section of a mine and, in case its condition necessitated sealing of that section, what steps would you take to insure the safety of the workers and the success of their work?

A.-Unless I had an oxygen-breathing apparatus, I would approach the fire on the



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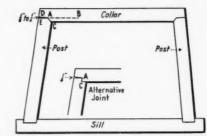
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the intake is completely stopped the fire will die down, and no gases will be moving, so a brattice can be erected on what was the return. The question makes no reference to unsealing and recovery, hence, the matter will not be discussed.

#### Timbering

Q.—Describe by a drawing a set of timber to resist roof and side pressure.

A.—Splitting the collar along the line AB which follows the grain of the wood is a risk to be feared, so AC is given a slope of 30 to 45 deg. to the horizontal, instead of being vertical, as in an alternative sketch for this joint. A little space, DE, of  $\frac{1}{6}$  to  $\frac{3}{4}$  in. is left so that if there is motion to the right, the point D and the line DA will not rise on knuckling and lift the end of the collar, removing the weight from AC, which



Timber set to resist roof and side pressure.

keeps the top of the post from sliding to the right. Lagging should be placed all along posts and collar or at least at even spacing or the distribution of weight will not be even. Be careful to avoid putting lagging at center of collar, for that will load the latter at the point where it will cause the greatest strain.

### Second Grade Mine Foremen's Examination— Pennsylvania, April 3, 1939

In the following will be found some of the questions presented at the second-grade bituminous mine foremen's examinations in Pennsylvania in 1939 with the answers prepared by the committee which propounded the questions and were the basis for the marking of the papers. The percentage awarded for a correct reply follows each answer.

#### Drainage

Q.—A sump in a mine is 80 ft. long, 12 ft. wide and 10 ft. deep and full of water. How long will it take a triplex pump to empty this sump, pistons being 6 in. in diameter, having a 9-in. stroke and each piston making 60 forward strokes per minute, the efficiency of the pump being 80 per cent? The sump has 100 gal. of water entering per minute.

 $A.-10\times12\times80 = 9,600$  cu.ft. of water in the sump.

 $0.5\times0.5\times0.7854\times0.75\times60\times3\times0.80\ \times7.48=158.62$  gal. of water pumped per minute.

 $\frac{9,600\times7.48}{158.62-100} = 1,224.97 \text{ min. or}$   $\frac{20.41 \text{ hours to}}{20.41 \text{ hours to}}$ 

 $\frac{6\times6\times0.7854\times9\times60\times3\times0.80}{231} =$ 

158.63 gal. water pumped per minute;  $9,600 \times 7.48$  divided by (158.63 - 100) = 1,224.76 minutes, or 20.4 hours. (3 per cent.)

(This official answer, being prepared for examiners only, is necessarily brief and may need further explanation. Area of pump piston in square feet = diameter in feet squared multiplied by  $0.7854 = 0.5 \times 0.5 \times 0.7854$ . Pump cylinder volume in cubic feet = area of piston in square feet  $\times$  length =  $0.5 \times 0.5 \times 0.7854 \times 0.75$ . With 60 strokes a minute and three cylinders, the volume delivered would be 180 times as large per minute except for the fact that the effective delivery is only 80 per cent, or  $80 \div 100 = 0.8$  of the volume involved. As there is about 7.48 gal. in a cubic foot, the number of gallons per minute will be, as stated,  $0.5 \times 0.5 \times 0.7854 \times 0.75 \times 60 \times 3$ 

 $\times$  0.8  $\times$  7.48 = 158.62 gal. of water pumped per minute.

As 100 gal. is entering the sump per minute, the pump draws from the sump 58.62 gal. more than enters it. The sump has  $80 \times 12 \times 10$ , or 9,600 cu.ft. of water when full, or  $9,600 \times 7.48$  gal. Therefore the time needed to pump the water out of the sump will be  $(9,600 \times 7.48) \div 58.62 = 1,224.97$  minutes, or 20.41 hours. The calculation which follows at the bottom of the official answer is based on cubic inches of water pumped instead of cubic feet and arrives, of course, at practically the same result. There are exactly 231 cu.in. to the gallon.)

#### Timbering

Q.—How would you timber a room 24 ft. wide that has a bad roof and a soft fireclay bottom?

A.—Under these conditions a systematic form of timbering should be adopted, posts being set in rows parallel to face and 3 or 4 ft. apart, center to center. Posts should be set on footboards or stringers to avoid their sinking into soft bottom, and long cap pieces or stringers 2 to 4 in. thick should be used above the posts to support the frail roof, set firmly but not driven up too tight.

On the roadways, crossbars should be set from 2 to 4 ft. apart, center to center, depending on depth of cover to support. Where needed, lagging should be used above the collars to prevent pieces of rock from falling out between the crossbars. Legs under the crossbars should be set on stringers or footboards on either side of the track. Where needed, additional crossbars should be set parallel with roadway and needled in over the coal face to protect the machine men while undercutting the coal, the machine runners to set props under each bar at the face as soon as undercutting permits space to set a prop. (6 per cent.)

#### First Aid

Q.—(a) What is a shock? Give the symptoms and treatment.

(b) How would you recognize arterial or venous bleeding?

(c) How would you control arterial bleeding?

A.—(a) Shock may be defined as a sudden vital depression of the nervous system and, to some degree, occurs after all injuries. It is caused by severe pain, loss of blood, fright, anger, surgical operations, seeing one's own injury or injuries of others, or accidents by electricity or gas. Shock is dangerous and should be given prompt attention.

When a person is suffering from shock, his face is pale and has an anxious expression, the eyelids droop, eyes are dull and pupils large; skin is clammy and covered with cold sweat; person is somewhat stupid and takes little interest in things about him. He may suffer from nausea and vomiting, and answers questions slowly. He may be partly or totally unconscious, or his mind may wander. Usually, he is perfectly quiet and will not move unless disturbed. At times, a person suffering from shock will be conscious and his breath shallow and feeble, pulse will be rapid and feeble and scarcely felt at the wrist. A doctor should be sent for at once.

Victim should be placed in comfortable position with head low, unless skull is fractured or head is bleeding. All foreign matter should be removed from mouth. He should be wrapped in warm clothing and kept as warm as possible by hot water bottles, hot bricks or lighted safety lamps. If patient is unconscious, do not give him anything by mouth, but pour aromatic spirits of ammonia on a cloth and place it under his nose.

Rub legs and arms toward body under the blankets, but do not uncover him. As soon as he can be removed safely, have him taken out of the mine and placed in a doctor's care. (4 per cent.)

(b) Arterial bleeding is recognized by its flowing in spurts from open wounds or cuts and by its bright red color.

Venous bleeding is recognized coming from open wounds or cuts in a steady flow of a darker red color. (1 per cent.)

(c) By application of pressure on the artery between wound and heart. (1 per cent.)

#### Mine Costs

Q.—An entry is driven 400 yd. at a cost of \$2 per yard; the ditch costs 15c. per foot, ties spaced at 2 ft. centers cost 17c. each. T-iron for the road weighs 25 lb. per yard, is in 30-ft. lengths and costs \$50 per gross ton. The spikes are worth 2c. each, splice bars cost 60c. per pair, bolts 3c. each. Labor to install was 11 days each for 2 men at the rate of \$6 per day. What was the total cost of the heading?

4	-400 yd. of entry @ \$2 per yd. 400 yd. of ditch @ \$0.45 per	\$300.00
	vd.	180.00
	600 ties @ \$0.17 each	102.00
	9 tons of rail @ \$50 per ton.	450.00
	2,400 spikes @ \$0.02 each	48.00
	80 pairs splice bars @ \$0.60	
	per pair	48.00
	320 bolts @ \$0.03 per bolt	9.60
	Labor-22 days @ \$6 per day	132.00

Total cost of heading \$1,769.60 (5 per cent.)



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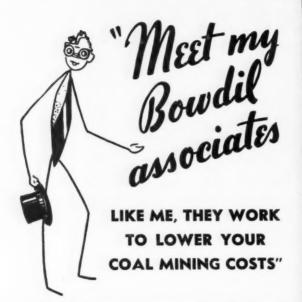
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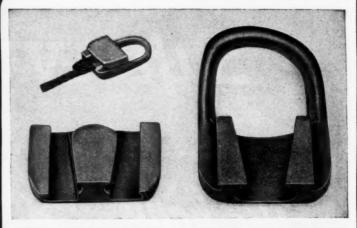
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This simple mechanical improvement of an item that is used in countless places in every coal mine has proved itself to be an efficient time and money saver. Revolutionary in design, it reduces "deadeye" installation costs, gives a more even pull when it's installed, and is completely safe. You can mount one onto any wire rope in two minutes—without tools. After the rope in use is broken, or you wish to replace it, you can remove the BOWDIL rope socket without punches . . . just knock the cap off. Surely this timesaving and production-increasing rope socket can be used to advantage on your operations. Investigate its possibilities.



# Solid Steel CUTTER BARS and CHAINS

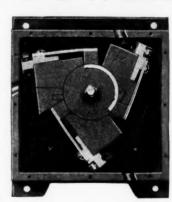
Thin  $(1\frac{1}{2})''$  thinner than ordinary cutter bars) . . . profitable (1''' to  $1\frac{1}{2})''$  less in cleft means a saving of 150 to 275 tons per acre mined) . . . and durable, the BOWDIL CUTTER BAR is designed and manufactured to give you more work per dollar invested. Put it on your toughest jobs . . . under twisting strains it won't kink, because it's made of specially developed alloy steel. There are no rivets to loosen and allow the guides to spread, and all the wear is taken on a hardened nickle steel block. And, for best results, use the BOWDIL Cutter Chain with the BOWDIL Cutter Bar. The unusually tough construction, abundant side clearance and handy socket bolts that allow for quick changing and reversing of bits on the BOWDIL chain makes the use of both practical and profitable.

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COAL CUTTING EQUIPMENT

Ohio

# WHAT'S NEW IN THE FIELD

# Chicago Plans Permanent Show Of Stokers and Coal Heat

L. G. Briggs, president, Midwest Stoker Association, retail stoker cooperative organization with headquarters in Chicago, announced on Sept. 16 that arrangements have been completed with the Merchandise Mart for a permanent stoker and automatic coalheat display on the Home Building Exhibit floor. More than 600 sq.ft. of space has been leased for 2½ years to display the products sold by the members of the association in Chicago and adjacent territory.

The exhibit will simulate a modern basement and will utilize different types of wallboard construction showing practical application to basement recreation and living rooms. It is expected that the exhibit will be opened to the public on or about Nov. 1. The Chicago Coal Merchants' Association is cooperating with the stoker association by assisting in defraying part of the expense of the exhibit and in helping to prepare unique demonstration illustrating the cleanliness and uniformity of modern bituminous coals for residental stoker use.

# Propose Higher Tonnage Quotas As Bootleg Remedy

A proposal that additional tonnage under the State's allocation program be allotted to operators who absorb free-lance miners has been offered as a solution of Pennsylvania's bootleg-coal problem. This plan is an outgrowth of conferences in Harrisburg between Governor James and the Committee of Twelve, the question being put in the hands of a subcommittee of four in the second week in September. This group, comprising two representatives of the operators and two for the miners, is to report back to the Governor soon.

The plan under consideration calls for absorption as quickly as possible of all former employees of legitimate collieries who are now working in bootleg holes. Those unable to qualify for admission to the legitimate industry, having never been anything but bootleggers, would be recommended for State and Federal unemployment compensation. Those who could qualify but who did not receive legitimate employment within a reasonable time, would be taken care of in a similar manner.

Martin F. Brennan, president, District 9, United Mine Workers, and a member of the subcommittee, said the union took the position that the anthracite industry could reemploy bona fide ex-miners without burdensome expense to the producing companies if the supplemental allocations were made. Both the operators and the miners are

opposed to employment of any outsiders or newcomers

W. W. Inglis, president of the Glen Alden Coal Co. and chairman of the Committee of Twelve, declared that the union had failed to take a sufficiently positive stand on what should be done to wipe out the bootleg mining that would remain after the eligible miners had been reabsorbed. (The plan under consideration makes no specific provision for closing bootleg operations other than those formerly worked by reemployed miners)

Other members of the subcommittee of four, besides Mr. Brennan, are Thomas Kennedy, secretary-treasurer, U.M.W.; Ralph E. Taggart, president, Philadelphia & Reading Coal & Iron Co., and James Pierce, Pierce Management.

### Circuit Judge Says Shutdown Was Labor Dispute

Kanawha Circuit Judge Julian F. Bouchelle ruled on Sept. 16 at Charleston, W. Va., that the Appalachian mine shutdown of April and May, 1939, was brought about by a labor dispute and the unemployment compensation department was correct in denying jobless pay to miners so made idle. The judge's ruling was made on an appeal by the United Mine Workers from adverse decisions of this department, a trial examiner and the department's three-man board

The decision affects about 20,000 claims filed for jobless pay totaling approximately \$5,000,000.

#### **Keeping Step With Coal Demand**

#### **Bituminous Coal Stocks**

(Th	ousand	e of Vot	Tone)
(11)		July 1 1940*	
Electric power utilities Byproduct coke ovens	7,448	$\begin{array}{c} 10.241 \\ 6.506 \\ 541 \end{array}$	$7.002$ $4.5^{\circ}6$ $512$
Steel and rolling mills Railroads (Class 1) Other industrials†	5,240	4,644 $12,631$	4,242 8,374
Total	37,538	34,563	24,665

#### Dituminant Coal Consumption!

Diraminous Cour		p	T
(T)	ousand	s of Net	Tons)
,	July 1940	June 1940	July 1939
Electric power utilities Byproduct coke ovens	$\frac{4,079}{6,603}$	3,839 $6,184$	$\frac{3,541}{4,748}$
Steel and rolling mills Railroads (Class 1)	6,391	6,199	5.903
Other industrials†	8,089	8.076	6,915

\* Revised. † Includes beehive ovens, coalgas retorts and cement mills. † Through an unfortunate typographical error, this section carried the caption "Bituminous Coal Production" last month.

# A.I.M.E.-A.S.M.E. Fuel Men To Meet in Birmingham

The fall meeting of the Coal Division of the American Institute of Mining and Metallurgical Engineers and of the Fuel Division of the American Society of Mechanical Engineers will be held jointly Nov. 7-9 at Birmingham, Ala. Under the chairmanship of Herbert S. Salmon (A.I.M.E.), Salmon & Cowin, Inc., with H. S. Kent (A.S.M.E.), Hays Corporation & Carrick Engineering Co., and Prof. J. R. Cudworth, School of Mines, University of Alabama, as co-chairmen, technical sessions will be held in the Tutweiler Hotel. The tentative program of papers follows:

"Uses of Coal." Prof. A. W. Gauger, Mineral Experiment Station, Pennsylvania State "Utilization of Coals or Coking College; "Utilization of Coals or Coking Coals," J. E. Tobey, vice-president, Appa-lachian Coals, Inc.; "A Laboratory Continuous Coal Pulverizer to Measure Net Power," Dr. W. H. Coghill, U. S. Bureau of Mines, Southern Experiment Station; Symposium on Coal Drying, Myron W. Mellor and C. H. J. Patterson, McNally-Pittsburg Mfg. Corporation; M. E. Fitze, Wisconsin Electric Co.; W. S. McAleer, Koppers Rheo-

# Bureau of Mines Men Listed

"Influence of Flame Turbulence in Combustion," B. J. Cross, Combustion Engineering Co.; "Steam Generation in Steel Mills," H. J. Kerr, Babcock & Wilcox Co.; "Sampling Characteristics of Coal," P. Nicholls and B. A. Landry, U. S. Bureau of Mines, Pittsburgh, Pa.; "Design Features of the Pittsburgh, Pa.; "Design Features of the 900-lb. Plant of Alabama Power Co. at Mobile," E. C. Gaston, Commonwealth & Southern Power Co.; "Some Non-Fuel Uses of Coal," O. C. Ralston and the late M. W. von Bernewitz, U. S. Bureau of Mines, College Park, Md.; "Excess Ash in Coke," James P. Dovel, president, James P. Dovel &

Sightseeing trips have been arranged for the second day to the following plants: Alpha Portland Cement Co., Woodward Iron Co., Sloss-Sheffield Steel & Iron Co., Stockham Pipe & Fittings Co., American Cast Iron Pipe Co., Republic Steel Corporation and Tennessee Coal, Iron & Railroad Co. Entertainment features will include a stag smoker on the evening of Nov. 7; banquet, Nov. 8, at which an address will be made by Governor Frank M. Dixon, and golf and football, Nov. 9.

Local subcommittees are:

General Arrangements-S. D. Moxley, American Cast Iron Pipe Co. (chairman); G. R. Armstrong, Sloss-Sheffield Steel & Iron Co.; A. J. Blair, Tennessee Coal; Iron & Railroad Co.; Tenney C. DeSollar, Wood-

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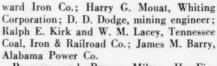
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Program and Papers—Milton H. Fies (chairman), DeBardeleben Coal Corporation; C. E. Abbott, E. J. Kohn and Richard L. Bowron, Tennessee Coal, Iron & Railroad Co.; Prof John M. Gallalee, University of Alabama; J. M. Hassler, Republic Steel Corporation; Prof. Charles R. Hixon, Alabama Polytechnic Institute; Howard Howie; J. E. Getzen; James T. MacKenzie, American Cast Iron Pipe Co.

Inspection Trips—Robert Gregg (chairman), Tennessee Coal, Iron & Railroad Co.; Charles L. Bransford, Republic Steel Corporation; William H. Coghill, Southern Experiment Station, U. S. Bureau of Mines; Ben Davis, Sloss-Sheffield Steel & Iron Co.; Kenneth R. Daniel; P. H. Haskell Jr., Alabama By-Products Corporation; W. D. Moore, American Cast Iron Pipe Co.

Publicity and Attendance—R. Burt Orndorff (chairman), vice-president, Tutweiler Hotel; James B. Bell, Young & Vann Supply Co.; Percy G. Cowin, Salmon & Cowin; H. A. Coy, American Zinc Co. of Tennessee; Neal Dugger, Tennessee Coal, Iron & Railroad Co.; F. J. Longworth, Tennessee Copper Co.; Edward O'Toole, American Coal Cleaning Corporation; Prof. Harold J. Sloman, University of Alabama; George D. Walters; L. E. Geohegan, Gulf States Steel Co.

Registration—R. A. Polglaze (chairman), Polglaze & Basenberg; George L. Bentley, Ingersoll-Rand Co.; Francis H. Crockard, Tennessee Products Corporation; Paul Wright, Paul Wright & Co.; E. J. McCrossin, Department of Industrial Relations.

Entertainment—Karl L. Landgrebe (chairman), Tennessee Coal, Iron & Railroad Co.; H. T. DeBardeleben, DeBardeleben Coal Corporation; Joseph W. Eshelman, Eshelman & Potter; Erskine Ramsay, Alabama By-Products Corporation; L. N. Shannon, Stockbam Pipe Fittings Co.; Mrs. James T. Mac-Kenzie.

# **Coming Meetings**

- Kanawha Coal Operators' Association: annual meeting, Oct. 17, Charleston, W. Va.
- Fourth Annual West Virginia Coal Conference, sponsored by West Virginia University and West Virginia Coal Mining Institute: Oct. 18 and 19, West Virginia University, Morgantown, W. Va.; joint sessions to be held with West Virginia Society of Professional Engineers, meeting Oct. 17-19 at Hotel Morgan.
- Illinois Mining Institute: Forty-eighth annual meeting, Oct. 25, Hotel Abraham Lincoln, Springfield, Ill.
- Coal Division, American Institute of Mining and Metallurgical Engineers: fall meeting, held jointly with Fuels Division of American Society of Mechanical Engineers, Nov. 7-9, Hotel Tutweiler, Birmingham, Ala.
- Harlan County Coal Operators' Association: annual meeting, Nov. 20 (tentative), Harlan, Ky.



George B. Harrington

#### Harrington Named Chairman For Cincinnati Conclave

George B. Harrington, president of the Chicago, Wilmington & Franklin Coal Co., Chicago, has accepted the chairmanship of the Eighteenth Annual Coal Convention and Exposition of the American Mining Congress, which is scheduled to be held April 28-May 2, 1941, at the Music Hall, Cincinnati, Ohio.

Under the direction of Mr. Harrington, industry committees representing coal-producing areas throughout the nation will prepare a convention program that will include discussions of all phases of coalmine operation, with particular reference to advances being made in the mine-modernization movement. In conjunction with the technical sessions there will be the usual complete exposition of coal-mine equipment and supplies.

#### **New Preparation Facilities**

Belle-Mead Coal Co., Glen Morrison, W. Va.: Contract closed with Fuel Process Co. for Belknap washer to clean 100 tons per hour of 3x3\frac{1}{4}-in. stove coal; to be installed by Oct. 15.

HANNA COAL CO. OF OHIO, St. Clairsville, Ohio: Contract closed with Centrifugal & Mechanical Industries, Inc., for one 26-in. mechanical discharge dryer to handle 3-in-in. x28-mesh coal; capacity, 21 tons per hour.

HUNTSVILLE-SINCLAIR COAL Co., Huntsville, Mo.: Contract closed with Centrifugal & Mechanical Industries, Inc., for one 48-in. gravity discharge dryer; capacity, 65 tons per hour of 0x3-in. coal.

INGLE COAL Co., Little Ditney Mine, Elberfeld, Ind.: Contract closed with Templeton-Matthews Corporation for design and construction of a new preparation plant to handle 250 tons per hour of mine-run delivered to the plant by a slope conveyor; sizes to be made include plus 6-in. lump, 6x4-in. egg, 4x2-in. nut, 2x1½-in. small nut, 1½x¾-in. stoker, and 0x½-in. carbon; remixing facilities are to be provided for loading any desired combination of the basic sizes and

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# SAYS MINE SHOVEL OPERATOR

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against wear. That's performance! It does not dry out or drip from the gears. There's economy! With twelve grades to choose from you can get the exact lubricant required for your job.

Let a Standard Lubrication Engineer specify the grade you need, either for open or closed gear lubrication or for wire rope protection. See if it doesn't more than satisfy you on all three counts.

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TANDARD OIL COMPANY (INDIANA)

crushing equipment is to be included for preparation of additional stoker coal or screenings; 4x0 size is to be pneumatically cleaned, Stephens-Adamson air-sand cleaner to be used on 4x and the Stephens-Adamson fine-coal cleaner on the 0x . The plant is to be in operation about Dec. 1.

LINTON-SUMMIT COAL Co., Linton, Ind.: Contract closed with Templeton-Matthews Corporation to design and build modern preparation plan to handle 400 t.p.h. of mine-run coal from No. 4 Indiana seam; seven sizes are to be loaded on six tracks, i.e.: plus 6-in. lump, 6x4-in. egg, 4x2-in. stove, 2x14-in. nut, 14x4-in. pea, 4-in.x10mesh stoker and 10-mesh x 0 carbon; all sizes under 6-in. will be hydraulically cleaned; complete crushing and rescreening facilities will be provided for all sizes under 6-in. for maximum production of stoker coal; centrifugal drying of all minus 1-in. coal is contemplated; minus 10-mesh carbon will be binned for regulated remixing with selected sizes of coal.

PEABODY COAL Co., Mine No. 7, Kincaid, Ill.: Contract closed with Centrifugal & Mechanical Industries, Inc., for one 48-in. mechanical discharge dryer to handle 50 t.p.h. of 10-mesh x 0 coal; to be shipped Nov. 1.

Peabody Coal Co., Kincaid, Ill.: Contract closed with McNally-Pittsburg Mfg. Corporation for two McNally-Vissac dryers to handle 160 t.p.h. of 1¼-in.x10-mesh coal; to be completed early next year.

SLOSS-SHEFFIELD STEEL & IRON Co., Flat Top (Ala.) Washery: Contract closed with Deister Machine Co. for one No. 16 Deister Plat-O table to clean 0x4-in. hutch product from jigs; addition to existing equipment.

United Electric Coal Cos., Fidelity Mine, Duquoin, Ill.: Contract closed with Koppers-Rheolaveur Co. for installation of stoker-coal sizing equipment and for changes in coal-preparation plant which will increase the capacity to 200 tons of washed stoker coal per hour; to be completed about Nov. 15.

#### C. & O. Extends Coal Lines

The Chesapeake & Ohio Ry. system has extended its service in the Raleigh County (West Virginia) coal field by purchase for \$550,000 of the Kanawha, Glen Jean & Western R.R.—a road built by the late William McKell two decades ago to develop his coal interests. The purchase-authorized by the Interstate Commerce Commission-includes 14 miles of single track and 12.28 miles of short line and siding, besides miscellaneous rolling stock, said Chief Clerk George Sheridan, The Virginian Ry. will be entitled to use the line, which extends 6 miles from Glen Jean to Tamroy, where it intersects at Sugar Creek Junction with a line which extends to Pax, forming a link with the Virginian.

#### Elk Horn Receivers Named

Affairs of the Elk Horn Coal Corporation, with offices in Cincinnati and Charleston, W. Va., and operations in eastern Kentucky, have been taken over by receivers. H. N. Eavenson, well-known Pittsburgh mining

engineer, and W. W. Goldsmith, Charleston attorney, have been named by Special Judge Beverly Broun in the Circuit Court of Kanawha County, West Virginia, and J. J. Moore, Pikeville (Ky.) lawyer and banker, has been appointed by Letcher County (Kentucky) Judge R. Monroe Fields. The company consented to the arrangement when the Bank of Mill Creek, W. Va., filed a complaint before Judge Broun charging the Elk Horn concern was unable to meet its obligations despite large assets and a solvent position.

# Cincinnati Coal Exposition Attracts Large Turnout

Coal was the headliner in Cincinnati, Ohio, from Aug. 20 through Sept. 2, when a coal exposition was held at the local Zoo under the auspices of Appalachian Coals, Inc.; Cincinnati Coal Exchange, Coal & Coke Merchants Credit Association, Greater Cincinnati Stoker Association, Solid Fuel Institute, coal-burning equipment manufacturers, and coal-carrying railroads. More than 253,600 persons visited the Zoo during the show, and it is safe to assume that most of them "sized up" the coal show, as the large booth was close to the entrance to the Zoo grounds.

The exposition featured one sample of each type of modern coal-burning equipment, including small water heaters, automatic range, hand-fired space heater, stoker-fired space heater, stoker-fired water heater, magazine-type heating stove, stoker, fully automatic warm-air heating plant equipped with bin-feed stoker, warm-air furnace, boiler of the type used for hot water or steam heat, and a new type of fireplace.

Products of coal also attracted much attention, especially those furnished by the DuPont Co., U. S. Bureau of Mines, and the Museum of Science and Industry. These included medicines, chemicals, plastics, artificial rubber, liquid motor fuels, perfumes and textile products. Nylon, of course, proved of most interest to women visitors to the exposition.

One stoker and the magazine-type stove were displayed under fire, burning coals

typical of those available in the Cincinnati market. Fuel engineers and other trained attendants manned the display during the entire show, telling the story of coal as "food for the furnace" and as a valuable basic material for many products used in every-day life. The managing committee also arranged for daily radio broadcasts so that even those who were unable to visit the coal exposition heard the story of coal over the air.

The entire exhibition was of a non-commercial nature and marked the first 100-per-cent cooperative sales-promotion effort of all coal interests in the city. It is expected that the exposition will be repeated in 1941 on a larger scale.

# Appellate Court Reverses Gray On Exemption Order

The U. S. Circuit Court of Appeals at Richmond, Va., issued a ruling on Sept. 26 reversing an order of Howard A. Gray, director of the Bituminous Coal Division, Department of the Interior, in which the latter refused to grant exemption from the terms of the Bituminous Coal Act to L. R. Powell Jr. and Henry W. Anderson as receivers of the Seaboard Air Line Railway Co. In the court's opinion, written by Judge John J. Barker and concurred in by Judges Armistead M. Dobie and Morris A. Soper, it was explained that the petitioners, as receivers of the railway, have leased certain coal mines in Virginia and West Virginia, have engaged independent contractors to mine the coal, and have been using the coal in the operation of the railway system.

In applying for exemption, the petitioners based their claim on the section of the act which states that its provisions "shall not apply to coal consumed by the producer or to coal transported by the producer for consumption by him." In refusing to grant exemption, Director Gray maintained that the petitioners were not producers of coal within the meaning of the act, since the actual mining was done by independent contractors. He ruled that the transactions between the petitioners and the mining contractors had



Coal show gives unusual air of coziness to zoo entrance

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The court declared, however, that the entire procedure, from mining to use of the coal, was in the hands of the petitioners. Actually, the court said, the petitioners have not been paying the mining contractors for the coal itself but rather for mining it.

### J. B. Morrow Elected New Head Of Pittsburgh Coal Co.

J. B. Morrow, lately vice-president in charge of production, was elected president of the Pittsburgh Coal Co. on Aug. 28. He succeeds J. D. A. Morrow (no relation), who resigned earlier in the month to become president of the Joy Manufacturing Co. The new president, who has been connected with the company for the last twelve years, first as preparation manager and later as production vice-president, has spent his entire business career in the mining, prepara-



J. B. Morrow

tion and chemical aspects of metals and coal.

His business experience began in the gold fields of Canada, after which he was associated for twenty years with the Phelps Dodge Corporation as chief chemist and general superintendent of the metal-mine department and later as head of its coal department. He has been conspicuous in engineering and research undertakings tending toward better preparation of coal.

#### **New Illinois Stripper Starts**

A new stripping concern known as the Schuyler Coal Corporation was scheduled to begin operations early in September in the Springfield No. 5 seam 2 miles northeast of Rushville, Ill. The company, of which W. H. Moseley is president and F. A. Bridge, vice-president, has a modern electric tipple and will prepare six sizes including treated stoker sizes. Other equipment includes combination shaking and vibrating

# THAT USEFUL CHART

of "130 Cues to Coal-Mining Profits" which was a supplement to April Coal Age

is still available for study and ready reference wall or desk display shows production for both anthracite and bituminous coal, breakdown of cost per ton of bituminous by regions, amount of mechanically loaded bituminous tonnage and number of units which have been installed, together with the growth of mechanical cleaning in the bituminous industry. "130 Cues to Coal-Mining Profits" also consists of a series of questions to stimulate thought as to the best methods to use in every coal-mining phase from new construction work on through all underground and strip work to preparation-plant practice and refuse disposal. WHILE THEY LAST: Price for single copy, 25¢; 25 copies for 20¢ per copy; 50 copies for 15¢ per copy and lots of 100 (or more) 10¢ per copy.



# LOADING-MACHINE LUBRICANTS

Leading operators in Southern Illinois, as in other mining districts, are using Cities Service Trojan Lubricants on Joy Loaders. They report very satisfactory performance and a reduction in lubrication costs.

These "Service Proved" lubricants,

backed by Cities Service Engineering Service, are effecting cost reductions in many mines and on many types of cutting and loading machines.

Investigate what they can do in your mine by sending in the enclosed blank today.



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TWINS OF MODERN MINING

# Air Clean your coal

• Some large tonnage users of the Stump Process are:

**Tipples** Coal Washeries types to suit re-Coal Cleaning

> by Air Process

Combination Wet and Dry Cleaning Plants

Dedusting Plants

Revolving Dumps Coal (Heat)

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Bell and Zoller Coal Mining Company Berwind-White Coal Mining Company Heisley Coal Company Island Creek Coal Company Monroe Coal Mining Company Pickands Mather and Company Pittsburgh Coal Company Rochester and Pittsburgh Coal Company Homer City, Pa. Westmoreland Mining Company

St. Michael, Pa. Nanty Glo, Pa. Holden, W. Va. Revloc, Pa. Mather, Pa. Negley, Ohio Blairsville, Pa.

• Of all air cleaning plants built during the last five years ninety per cent have employed the Stump Process

Whatever your preparation needs may be, our engineers can find the proper answer.

We invite your inquiry and place at your disposal our consulting service, testing plant and laboratory.

Write for Bulletin No. 153.

# ROBERTS and SCHAEFER CO.

307 North Michigan Avenue, Chicago

screens, electric conveyors and adjustable loading booms. Stripping will be done by a Lima dragline and loading in the pit with a Marion diesel shovel. Though the tipple was built primarily for truck loading, there will be facilities for shipment by both rail and via the Illinois River.

### To Keep Records on Cost Of Conveyor Belts

In an effort to have consumers keep careful records of costs on conveying belting in use, the B. F. Goodrich Co., Akron, Ohio, has published a new edition of "Cost Finding Record for Conveyor Belts." The volume contains twelve record sheets of two pages each, sufficient to keep a complete record on twelve conveyor belts for six years, with tonnage records for each month on each belt.

Listing is provided on the sheets for all essential information on the belt, including make, brand, duck weight, length, width, number of plies, type of joint, lacings used, best previous record of belt on the installation, date received and installed, date removed, time in use, invoiced cost, cost of repairs, total cost, total tonnage handled, and cost per ton. Space also is provided for a maintenance record, a description of the layout, pulleys, idlers, and every other important factor that goes into a conveyor belting problem. Copies of the booklet are available on request to the manufacturer.

### Stoker Maker Climaxes Drive With "Open House"

As a climax to a six-weeks drive, Link-Belt Co. announced that on Sept. 18 it would throw open the doors of its Caldwell-Moore stoker plant to the public to celebrate the tooling up for mass production of the new "Challenger" low-priced bin-fed automatic stoker. The open house was arranged as the high spot in an intensive advertising and promotional campaign with special advertisements in two Chicago daily papers and twelve foreign-language newspapers.

During September also a contest was on among the company's Chicago dealers to decide the best window display, for which



Challenger domestic stoker, cut-away showing burning head

#### Permissible Plates Issued

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Four approvals of permissible equipment were issued by the U. S. Bureau of Mines in August, as follows:

American Mine Door Co.: Type LG "Dustributor" (rock-dusting machine); 3-hp. motor, 230 volts, d.c.; Approval 410; Aug. 3.

Sullivan Machinery Co.: Type 7-B-1 shortwall mining machine; 50-hp. motor, 220 and 440 volts, a.c.; Approvals 411 and 411A; Aug. 20.

Justrite Mfg. Co.: Justrite emergency dry-cell lamp, cap type; Approval 1019; Aug. 10.

Portable Lamp & Equipment Co.: portable special electric lamp for intermittent service; Approval 1020; Aug. 30.

a prize will be bestowed. A special invitation likewise was extended to coal dealers and others interested in automatic heat with coal to visit the stoker plant to note the progress made in six years in improving the quality of stokers while lowering the manufacturing cost.

# Subscriptions to Coal Research Near \$240,000 Goal

Subscriptions to the program planned for Bituminous Coal Research, Inc., were less than \$40,000 behind the goal on Sept. 16. Sponsors of the plan to revive the research activities of that organization set \$235,000 per year for three years as the minimum. Actual subscriptions by mid-September totaled \$201,300. This amount had been pledged by 10 coal associations, 3 railroads and 33 individual coal-mining companies. The standard rate of subscription is one-third of a mill per ton.

Coal associations agreeing to support the work are: Belleville Fuels, Inc.; Big Sandy-Elkhorn Coal Operators' Association, Coal Trade Association of Indiana, National Coal Association, New River Coal Operators' Association, Northern Illinois Coal Trade Association, Operators' Association of the Williamson Field, Southern Appalachian Coal Operators' Association, Virginia Coal Operators' Association, Virginia Coal Operators' Association and Western Pennsylvania Coal Operators' Association. The subscription of the National Coal Association is not on a tonnage basis but is for the flat sum of \$5,000. Cooperating railroads to date are the Chesapeake & Ohio, Norfolk & Western, and Virginian.

The roster of subscribing coal companies is: American Rolling Mill Co., Amigo Coal Co., Black Eagle Smokeless Coal Co., Boone County Coal Corporation, Brule Smokeless Coal Co., Buckeye Coal & Coke Co., Carbon Fuel Co., Clover Splint Coal Co., Dawson Daylight Coal Co., Delta Coal Mining Co., Dickinson Fuel Co., Dunedin Coal Co., Fire Creek Coal & Coke Co., Hatfield-Campbell Creek Coal Co., Island Creek Coal Co., Jamison Coal & Coke Co., Lillybrook Coal Co., MacAlpin Coal Co., Mason Coal Co.,



The SuperDuty Table presents an entirely new idea in coal washing tables. In every respect it is complete unto itself and does not "pass the buck".

The SuperDuty Table with adequate built-in frame and support members—factory aligned and factory finished as the manufacturer's responsibility and contribution to 100% user satisfaction—is a finished machine for finished performance. It embraces more than just a head motion, deck and a few slide bearing units—an old idea that passes on to the customer a major job of final assembly, coordination of parts, and operating alignment—actually requiring the addition of adequate frame and support elements at extra installation expense and at the customer's full responsibility.

The result of the SuperDuty idea is the smoothest and easiest running table ever built, thus assuring marked improvement in capacity and coal washing efficiency, while low costs of operation and maintenance further challenge comparison.

# The Deister Concentrator Company

The Original Deister Co.
Incorporated 1906

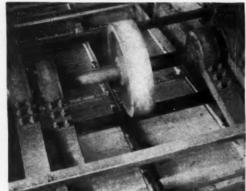
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FORT WAYNE, IND. U. S. A.

Spray Nozzles • Duplex Washing Tables • Leahy Screens • Constriction Plate Classifiers



# Years of Practical Experience



Bixby-Zimmer dewatering screen for fine washed coal in preparation plant of Southwestern Illinois Coal Corporation. Other installations in Southern Illinois include such producers as Chicago, Wilmington & Franklin, Peabody, Pyramid, Sahara, Truax-Traer and United Electric.

# built these DEWATERING SCREENS

Many Southern Illinois Producers are satisfied Users of BIXBY-ZIMMER **SCREENS** 

ducers of Chicago, Wilabody, Pyramid, Sahara,
Electric.

use of abrasive resisting materials of maximum hardness with no distortion or binding in assembly. All welded joints insure built-in tension requiring minimum amount of fastenings for quick installation.

quick installation.

These tailor-made screens—tailored to fit your plant and condition—are non-clogging and give positive permanent sizing.

B-Z screens assure you a longer life as screen openings are maintained even though rods are 50 per cent worn away.

It's an all-American product, backed by sound engineering and plant facilities for quick delivery.

WRITE TODAY for this bulletin which will give you all details on construction and sizes and why B-Z screens can be tailor-made to solve your devcatering problem.



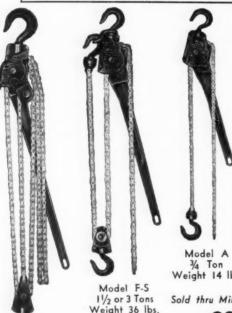
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GALESBURG

HILINOIS

# COFFING SAFETY-PULL

RATCHET LEVER HOIST



Convertible

3/4 Ton Weight 14 lbs.

# . . . . THE BIG MINES OF SOUTHERN ILLINOIS SAFELY AND ECONOMICALLY SPEED UP LIFTING AND PULLING JOBS

Majestic No. 14 Mine of the Peabody Coal Company is taking advantage of the many money- and time-saving opportunities made possible with Coffing Safety-Pull Ratchet-Lever Hoists. One man and this hoist can handle any number of routine or emergency re-pair and maintenance jobs at a tremendous saving in time and manpower.

This is the original ratchet lever hoist with the unusual safety feature of a dual ratchet and pawl assembly with the handle always under control. Cap. from 3/4 to 15 tons — weights 14 to 150 lbs. Operates in any position.

Sold thru Mill Supply Houses throughout the country.

COFFING HOIST CO. DANVILLE, ILLINOIS

COFFING ADVANCED HOISTS

RATCHET LEVER ● SPUR GEAR ● ELECTRIC LOAD BINDERS ● TROLLEYS ● DIFFERENTIALS

E. C. Minter Coal Co., Mullens Smokeless Coal Co., New York Coal Co., Pemberton Coal & Coke Co., Pond Creek Pocahontas Co., Princess Dorothy Coal Co., Raleigh Coal & Coke Co., Rochester & Pittsburgh Coal Co., Sentry Coal Mining Co., Sheridan-Wyoming Coal Co., Slab Fork Coal Co., Sterling Smokeless Coal Co., Truax-Traer Coal Co., and Wyatt Coal Co.

E. R. Kaiser, assistant to the president, Bituminous Coal Research, Inc., Columbus, Ohio, is in charge of the campaign to raise funds. His subscription books are still open.

#### St. Louis Adds Six Inspectors To Smoke Control Staff

Six new inspectors have been added to the staff of Smoke Commissioner Raymond R. Tucker of St. Louis, according to an announcement by Mayor Dickmann. At the same time eight inspectors who have been working in the office on a temporary basis were given permanent appointments. The new appointees are Francis E. Hornsby, Harry F. Perkins, Arthur W. Cassidy, Ray-mond E. Zink, John M. Walsh and Leonard H. Gaines.

By law the Commissioner is allowed eighteen men on his staff. He said additional appointments would be made as the need for them occurred.

#### Safety Trophies Presented By Company Officials

Presentation of the "Sentinels of Safety" trophy won by Winton No. 1 mine of the Union Pacific Coal Co. for the best accidentprevention record among bituminous coal mines in 1939 was made Sept. 7 at Rock Springs, Wyo., by Cadwallader Evans Jr.,



Cadwallader Evans, Jr.

vice-president and general manager of the Hudson Coal Co., Scranton, Pa. In return, Eugene McAuliffe, president of the Union Pacific Coal Co., will go to Scranton to present a similar trophy to the Hudson Coal Co., whose Eddy Creek mine, at Olyphant,

Weight 49 lbs.

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No. 10

Eugene McAuliffe

Pa., rated highest among anthracite mines from the standpoint of safety last year.

These trophies are awarded annually by the Explosives Engineer magazine for outstanding achievements in accident-prevention work. Three hundred and sixty mines and quarries operating in 41 States took part in the national safety competition of 1939, which was conducted by the U. S. Bureau of Mines. Winton No. 1 mine was operated last year for 277,139 man-hours without a lost-time accident. The Eddy Creek mine was operated for 626,456 man-hours in 1939 with 27 disabling injuries causing 337 days of disability.

# N.C.A. Leads Opposition to Texas-New York Gas Line

With a meeting of coal and railroad counsel and other interested parties held in Washington on Aug. 29 to outline a program the National Coal Association joined the forefront in coordinating opposition to the proposed Texas-New York natural-gas pipe line of the Reserve Gas Pipe Line Co. The proposed line would traverse twelve States and contemplates natural-gas service to 3,500,000 present consumers of manufactured gas in the Philadelphia, New Jersey and New York areas.

An important feature of the N.C.A. campaign is a leaflet pointing out what construction of the line would mean to Eastern business and labor. The brochure, which is being given widespread distribution, says "A solar plexus blow to the coal industry would be dealt if this pipe line materialized and functioned as is proposed and claimed. The closing down of the plants now manufacturing gas would have far-reaching repercussions—loss of employment at these plants, losses to the railroads in coal freight tonnage and to railroad labor; shrinkage in the mine output of coal, and loss in employment at the mines—a very large loss."

Thomas Kennedy, secretary-treasurer of the United Mine Workers, said the union would try to prevent construction of the line. "The company," said Mr. Kennedy, "is quoted in a statement released by the Federal Power Commission as citing one of the

# NUMEROUS MECHANIZED MINES in Southern Illinois use SEAL-TITE TAMPING BAGS



Less costly to use and you get

# SAFER BLASTING

SEAL-TITE is the safer, faster, cheaper method of sealing shots. Properly tamped holes will cut powder costs and help your blasting crew in bringing down falls. Investigate now—see why they are so widely used. Available in 65 different stock sizes for all needs. Fast shipment to you from stock.

### Used with "the Dummy Maker"

"The Dummy Maker" and 2 helpers can pack 400 to 600 bags an hour. This efficient machine pays for itself quickly—no complicated machinery—easy to use—dependable—steps up working efficiency—saves time and costly skilled labor—ruggedly built to withstand constant use—uses clay or sand for stemming material—mounted on trucks for portability—operates on ½ h.p. motor.

WRITE OR ASK FOR

In the foreground of picture above are several SEAL-TITE TAMPING BAGS. They are used exclusively at this Buckhorn mine, as well as at the New Monarch and Jefferson No. 20 properties of Consolidated Coal Co.

Prominent among the users of SEAL-TITE TAMPING BAGS is the Franklin County Coal Company's Royalton No. 7 Mine.

The largest mining companies in United States and throughout the world use SEAL-TITE TAMPING BAGS with great success.

SEAL-TITE KRAFT 100%

Our guarantee of Satisfaction

THE TAMPING BAG COMPANY

MT. VERNON, ILL.



# and QUAKER STATE finds all 3 STERLING PUMPS are TROUBLE FREE!

Back in the spring of 1933 we put in the first Sterling Deep Well Turbine for the Quaker State Oil Refining Corporation plant near Bradford, Pa. It was a 10" 4 stage unit employing 25 H.P. motor. Later a small unit employing a 3 H.P. motor was installed.

So reliable, so low in maintenance costs and so trouble-free were these two turbine pumps that in November, 1937, Quaker State ordered a third Sterling—a 10" 7 stage pump with 75 H.P. motor. And again Sterling's free floating drive shaft and precision assembly have given Quaker State savings plus trouble-free operation.

If you want to make savings in handling water, or if you have water handling problems, we can help you. Write us about your problems—today.

# STERLING PUMP CORP.

Hamilton, Ohio

Stockton, Cal.

#### Representatives

EVANSVILLE, IND. Shouse Machinery Co. HUNTINGTON, W. VA. C. Ney. Smith SCRANTON, PA. Scranton Electric Construction Co. PITTSBURGH, PA. Bushnell Machinery Co. KNOXVILLE, TENN.
Tennessee Mine & Supply Co.
DENVER, COLO.
Thompson Manufacturing Co.



Few Sterling
pump owners
need service
—but if you
need it, Sterling gives
service from
coast to coast.

#### Miner Raises Prize Blooms

A Winona (W. Va.) miner who turned to professional flower growing several years ago when a strike threw him out of work won the "queen of the show" award at the annual Old White dahlia show at White Sulphur Springs, W. Va., this year. The winner, Charles Kilgore, had won the top award for four consecutive years, his prize entry this year being a "Yellow Marvel" cactus dahlia. Mr. Kilgore also won the professional sweepstakes with the most first, second and third place awards.

reasons for the construction of this line to be 'to aid in carrying forward the program of national defense.' There was "more than sufficient solid coal available in the Eastern States to provide energy for the national defense program," he contended, and by increasing working time from the present two or three days a week the mines "can more than meet the fuel requirements of the nation."

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# Personal Notes

N. C. Anderson, general manager, Huerfano Coal Co., was reelected president of the Colorado and New Mexico Coal Operators' Association at the 22d annual meeting. Other officers renamed are: vice-president, W. J. THOMPSON, president, Colorado & Utah Coal Co.; secretary-treasurer-traffic manager, F. O. SANDSTROM. The following committees also were named: executive-N. C. Anderson (chairman), Douglas Mil-LARD, F. O. SANDSTROM, B. W. SNODGRASS, W. J. THOMPSON; traffic-F. O. SANDSTROM (chairman), J. C. LARKIN, E. G. PLOWMAN, J. D. SACE; legislative—N. C. Anderson (chairman), George B. Dick, Homer H. HARRIS, H. E. MACDONALD, W. G. MOORE, E. M. OLIVER, B. W. SNODGRASS, W. J. THOMPSON, KENNETH WOOD.

A. F. DIAMOND, division superintendent, Davis Coal & Coke Co., Coketon, W. Va., was reelected president of the Preston County Coal Mining Institute at its annual meeting. Other officers named are: vice-presidents-N. W. MONTGOMERY, superintendent, Hillman Coal & Coke Co.; S. B. JEFFERIES, superintendent, Mastellar Coal Co.; F. W. CUPP, superintendent, Cumberland Coal Co.; N. P. REIDLER, superintendent, Houck & Reidler Bros. Coal Mining Co.; P. E. McKINNEY, superintendent, Preston County Coke Co.; HAROLD REAM, general manager, Stanley Coal Co.; SENATOR A. L. HELMICK, manager, Blackwater Coal Co.; WILLIAM MOORE, inspector at large, State Department of Mines; secretary-treasurer, H. B. WICKEY, preparation and safety manager, Davis Coal & Coke Co.

I. S. GILLESPIE has been appointed mining engineer by the National Coal & Coke Co., operating in Walker County, Alabama.

M. M. HALEY has been appointed chief engineer of the Block Coal & Coke Co. with

headquarters at Block, Campbell County, Tenn., vice J. C. Elmore, resigned.

RALPH E. Jamison, vice-president, Jamison Coal & Coke Co., Greensburg, Pa., has been elected president of the Western Pennsylvania Coal Operators' Association, vice J. D. A. Morrow, resigned. J. B. Morrow, president, Pittsburgh Coal Co., has been elected a director.

CREED P. KELLEY, Big Stone Gap, has been appointed State mine inspector by Governor James H. Price of Virginia. Though appointed by the chief executive he will function under and report to Commissioner of Labor and Industry Thomas B. Morton. He also will serve as a member of the board of examiners which certifies certain employees of coal mines.

MARCUS KERR, of Logan, has taken over the duties of chief of the Ohio Division of Mines, at Columbus. He succeeds Andrew GINNAN, of Jacksonville, who had been acting head since last January.

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R. F. Kirkwood, formerly superintendent at the Sumiton mine, Alta Coal Co., Sumiton, Ala., has been transferred to the No. 2 mine of the Cane Creek Mining Co., Bankhead, Ala., as mine foreman-superintendent.

THOMAS W. LANGFORD has been appointed smoke abatement inspector under a department recently created by the city of Birmingham, Ala., to make a study of the smoke problem in the metropolitan area and take measures for its control and eventual abatement. Mr. Langford, formerly master mechanic with the Tennessee Coal, Iron & Railroad Co., will serve in the department of Commissioner J. W. Morgan, his appointment being effective Sept. 15. The functions of the department will be of an educational nature for a reasonable time.

H. C. LIVINGSTON has been made chief engineer of the Union Pacific Coal Co. with office at Rock Springs, Wyo. He will give special attention to surface design and construction work.

Hooper Love has been elected president of the West Kentucky Coal Co. and its subsidiaries, the St. Bernard and Peoples coal companies. He succeeds the late Charles F. Richardson. Mr. Love has been associated continuously with the St. Bernard Coal Co. for 34 years and became vice-president of the West Kentucky company in 1938.

I. W. MILLER has been made general superintendent of mines of the Black Diamond Coal Mining Co. and associated companies in Tennessee and Alabama. He resigned as chief of the coal-mining and geological department of the Tennessee Coal, Iron & Railroad Co. to accept the new connection.

R. H. Mulky, mine foreman, Leckie Collieries, Aflex, Ky., has been promoted to superintendent, Borderland Collieries Co., Borderland, W. Va., vice C. C. Wilburn, transferred to the Leckie Smokeless Coal Co., Anjean, W. Va.

V. O. MURRAY, superintendent at Rock



# Repeat Orders TELL THE STORY

-Note the Graph above-

In the Southern Illinois coal field fully half our total volume to date for 1940 is repeat business - - -

The "Selectro" must be good to merit this confidence - - - why not investigate.



# "SELECTRO"

The Vibrating Screen that is completely adjustable to your needs—by virtue of these exclusive features

- 1-Adjustable Stroke
- 2—Full Floating Shaft
- 3—Oil Lubrication
- 4—Easy Tilting
- 5—Safety

The Selectro has Greater Advantages

# PRODUCTIVE EQUIPMENT CORPORATION

2926-28 W. LAKE STREET

CHICAGO, ILLINOIS



1,510,000 tons of wet coal have been passed over this belt conveyor in the plant of the Potter Coal & Coke Co. during some nine years, but the 25 to I ratio De Laval worm gear through which the belt is driven has given no trouble and has required no repairs.

# DE LAVAL WORM GEARS

are: 1—Correctly designed by engineers who have had extended experience with such gears,

- 2—Accurately manufactured by skilled men using suitable special tools, and
- 3—Made from the best of materials, carefully chosen and properly heat-treated.

They solve problems of driving heavy machinery at slow and medium speeds from standard or high speed motors or steam turbines.

DE LAVAL STEAM TURBINE CO., TRENTON, N. J.



Springs No. 4 mine, has been promoted to general superintendent of the Union Pacific Coal Co. with office at Rock Springs, Wyo, THOMAS OVERY SR. has been named to Mr. Murray's old post.

JAMES W. NICHOL JR. has been appointed superintendent of the Sumiton mine of the Alta Coal Co., Sumiton, Ala. He was formerly assistant superintendent of mines.

ROY RATLIFF has been made general manager of the coal-mine operations of the Sloss-Sheffield Steel & Iron Co., Jefferson County, Alabama. He was formerly assistant to Ben Davis, vice-president in charge of operations,

Miss Josephine Roche was reelected president and general manager of the Rocky Mountain Fuel Co., Denver, Colo., at the annual meeting of stockholders, Aug. 28.

- L. E. Scholl has been appointed superintendent of the Princess Dorothy Coal Co., Eunice, Raleigh County, W. Va. Prior to the change he was general foreman, Mine No. 3 of the Christian Colliery Co., Mahan, W. Va.
- C. E. SWANN, formerly chief engineer of the Union Pacific Coal Co., Rock Springs, Wyo., has been appointed special engineer. In his new capacity he will have charge of underground mine development planning, real estate and taxes.

# Obituary

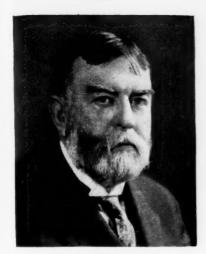
GEORGE KELLOCK, 57, vice-president and general manager of the International and McGillivray Coal & Coke companies, Coleman, Alberta, Canada, died suddenly in that city on Sept. 4.

FREDERICK W. GRICE, 54, sales engineer for the Broderick & Bascom organization, died suddenly Aug. 25 at his home in Webster Grove, Mo., of a heart attack. Joining Broderick & Bascom in 1908, soon after his graduation from the engineering school of Washington University, he specialized in materials handling problems for the coal industry, being the inventor of two important devices which contributed to the development of aerial tramways.

EDWARD GEORGE BLACKER, 65, veteran coalmine superintendent and former State mine inspector, died late in August in a hospital at Superior, Wyo., of abdominal hemorrhage.

CHARLES HARGETT, 47, assistant mine manager for the Union Colliery Co., Dowell. Ill., was instantly killed in the night of Sept. 14 when caught under a fall of top coal while at work. He had been employed by the company for many years.

DAVID GIRVAN, 65, superintendent at Truesdale colliery of the Glen Alden Coal Co., Nanticoke, Pa., died Sept. 24 at Moses Taylor Hospital, Scranton, where he had been a patient for three weeks. He came to this country from Scotland as a boy, becoming a breaker boy at the age of 9 and working his way up.



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Leonor F. Loree

#### Leonor F. Loree Passes

Leonor F. Loree, 82, president for 31 years of the Delaware & Hudson Co. until his retirement, two years ago, died Sept. 7 at his home in West Orange, N. J. The Delaware & Hudson Co. is holding company for the Delaware & Hudson R. R. and the Hudson Coal Co. Mr. Loree entered the service of the Pennsylvania R.R. in 1877 and had a long and picturesque career in railroading, being at various times head of the Baltimore & Ohio; Chicago, Rock Island & Pacific; St. Louis & San Francisco, and Kansas City Southern roads.

### Illinois Official Reverses Ruling On Cardox Shooting

Reversing a ruling of March 1, Attorney General John Cassidy of Illinois held on Sept. 11 that the Cardox method of breaking down coal seams in Illinois while men are at work does not come within the provisions of the State shotfirers' act. The act requires that in all cases where more than 2 lb. of powder is used to blast coal the persons firing the shots be English-speaking citizens and that before the blast occurs the mine be cleared of all men whose presence is not absolutely necessary.

The Cardox breaking method, said Attorney General Cassidy, uses a steel tube of carbon dioxide under pressure which is inserted in a drillhole at the mine face. The tube contains less than 1 lb. of powder, he said, which is touched off electrically, increasing the gas pressure within the tube so that the expanding gas escapes from ports in the tube and breaks down the coal. The small quantity of powder used, the Attorney General said, "would not equal in force the shot produced by 2 lb. of common powder ordinarily used in blasting coal."

### Safety Teams Make High Scores

With a score of 99.03 out of a possible 100, the first-aid team of No. 1 shaft, No. 9 colliery, won first prize in the contest of teams of the Pagnotti collieries, held Aug. 24 at Sgarlat Lake, Pa. Second prize was

MODEL MINES of FRANKLIN COUNTY COAL CO. use MOSEBACH TROLLEY SWITCHES





Operators of Franklin County Coal Company's mines at Royalton and Herron, Illinois, know how to keep efficiency high, operating costs at a minimum. One precaution they take is to specify Mesco Trolley Section Switches.

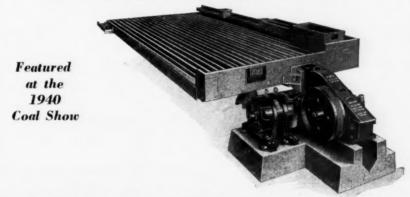
Mesco Switches are ruggedly designed to stand up under severe service—yet they
MIDWEST

are built with great precision, for safety and efficiency in use. Constructed of high quality bronze, they are available in all types and sizes, for use with any size trolley wire and feeder cables. The switch blades are easily interchangeable, for right or left hand. Write for full details about Mesco Insulator Switches or any of the following Mesco Products: RAIL BONDS, MESCO WELDING MA-CHINES, TROLLEY FROGS, SPITCERS, WHEELS, POLEHEADS, HARPS, GLIDERS and GROUND CLAMPS.

EVANSVILLE ELECTRIC & MFG. CO. 600 W. Eichel Ave., Evansville, Indiana

SUPPLY COMPANY ELECTRIC 1115 Arlington Avenue Pittsburgh, Pa.

# DEISTER PLAT-O COAL WASHING TABLE



Here's the answer to the coal washing problem where conservation of space is highly important. The new DEISTER PLAT-O COAL WASHING TABLE cleans much larger tonnages, effecting a marked saving in space now required for this work. New contour of the deck surface; new system of riffling; more effective differential action of the heavy duty PLAT-O SELF-OILING HEAD-MOTION enable this table to handle much larger tonnages per unit of occupied floor space. Write for Bulletin No. 16-B

# DEISTER MACHINE COMPANY 1933 E. WAYNE STREET (INCORPORATED 1912) Coble Address "Deister" FORT WAYNE, INDIANA EMIL DEISTER, SR., Pres. • I. F. DEISTER, V.Pres. • EMIL DEISTER, JR., Secy.Treas.

Manufacturers of PLAT-O Coal Washing Tables, PLAT-O Ore Concentrating Tables, Heavy Duty PLAT-O Vibrating Screens, Deister Cumpound Funnel Classifiers.

October, 1940 - COAL AGE

# Leading in Illinois Mines, too



# and here is the proof-

Southwestern Illinois Coal pictured above, Bell & Zoller, and C. W. & F. Coal, Consolidated, Franklin County, Old Ben, Peabody—Pyramid, Sahara, Southwestern Illinois, Truax-Traer, United Electric, and Valier—just a few of the Illinois mines using Streeter-Amets to print the weight of cars in motion. Repeat orders from these operators prove the machine's performance. More coal mines throughout the country print weights with Streeter-Amets than with all other recording devices totaled together. It's so simple to make a Streeter-Amet installation—no delay—not even a capital investment for railroad Recorders.

The rugged Streeter-Amet can be attached to any scale or installed complete with scale levers. There is a Recorder for every coal weighing job—16 distinct types. Can you afford to take a chance on questionable penciled weights, tolerate unnecessary scale and engine wear, and enforce extra work to stop loads on the scale when the machine will print dependable weight records, weigh moving loads, and remotely control gates or dumps automatically? Write for literature describing the Streeter-Amet line for coal mines—Scales, Recorders, and Dials.

STREETER-AMET COMPANY
4105 RAVENSWOOD - CHICAGO



captured by the outside team from Sullivan Trail colliery, with 98.74; third, No. 8 shaft, No. 9 colliery, with 98.57. The winning team received a trophy, and the next three received suits of clothes. Following the contest, all the employees were guests at a beefsteak dinner, at which Burgess James Tedesco was master of ceremonies. More than 1,200 persons witnessed the competition.

### Miners Retaliate on Smoke Law With St. Louis Boycott

A resolution of retaliation against St. Louis for that city's drastic smoke ordinance was adopted Aug. 28 by the constitutional convention of the Illinois Progressive Mine Workers at Springfield. "We will turn our trade to those who help us," the resolution said. The wording of the resolution, however, is not such as to preclude entirely the buying of St. Louis-made goods but provides something of a "reciprocal trade program" whereby the miners agree to patronize any business which continues to use Illinois coal.

Sponsored by the O'Fallon local union, the resolution puts the convention on record as "asking all members of the A.F.L. organizations in Illinois and Missouri to buy Illinois coal mined by the P.M.W. so as to give us a chance to help build Illinois larger, and we will turn our trade to those who help us."

### Delaware Tops Hudson Teams In First-Aid Meet

Top honors were captured by the Delaware colliery team at the Hudson Coal Co.'s second annual first-aid meet, held Sept. 14 at Heart Lake, Jermyn, Pa. With a score of 99.26, the Delaware group barely nosed out the Jermyn colliery team, which scored 99.25. Other teams finished in the following order: Marvine, 98.98; Eddy Creek, 98.94; Pine Ridge, 98.94; Olyphant, 98.56; Laflin, 98.40; Coal Brook, 98.39; Gravity Slope, 98.34; Loree, 97.84; Baltimore No. 5, 97.63; Baltimore Tunnel, 96.91; Providence Shop, 95.91; and Rock Force, 95.71.

Officials for the competition were J. J. Forbes, U. S. Bureau of Mines; R. T. Wall, Hudson Coal Co., and R. D. Currie, American Reinsurance Co., who were chief judges. Edgar C. Weichel awarded the prizes for the Hudson Coal Co., while James A. Linnen Jr. made presentations on behalf of the American Red Cross.

# Sonman Blast Set Off by Spark, Says Mine Bureau

"A faulty system of mine ventilation that carried currents of air containing explosive methane to the trolley wires of an electric locomotive" was responsible for the explosion on July 15 at the Sonman Slope mine of the Koppers Coal Co., in which 63 men lost their lives, says a statement by the U.S. Bureau of Mines issued Sept. 2. "Investigators," it added, "are of the opinion that

this explosion originated at the junction of No. 3 haulageway and 16 right; that the explosion was caused by the ignition of gas by an arc or spark from an electric trolley locomotive; and that the gas was liberated suddenly by a fall of roof in 28 room off 17 right and carried from there by the air current to the point of ignition.

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"Few, if any, of the men were killed outright by burns or violence, and it is probable that the eventual cause of death in all cases was afterdamp." The Bureau recommended that steps be taken to insure the use of trolley wires only in currents of pure intake air instead of in air returning from sections of the mines where it might be laden with gas.

# Imboden Team Takes Top Honors In Virginia Safety Meet

Imboden team of the Stonega Coke & Coal Co. captured top honors at the Virginia first-aid contest, held Sept. 2 at Pennington Gap, Va. The meet was sponsored by the Miners Athletic Association of Lee County, Va., in conjunction with the coal operators of that county.

Other teams finished in the following order: second, Dunbar team, Stonega Coke & Coal Co.; third, No. 7 team, Benedict Coal Corporation; fourth, Noll-12 team, Benedict Coal Corporation; fifth, Imperial team, Virginia Iron, Coal & Coke Co.; sixth, tie between Roda No. 1 team and Derby No. 2 team, Stonega Coke & Coal Co.

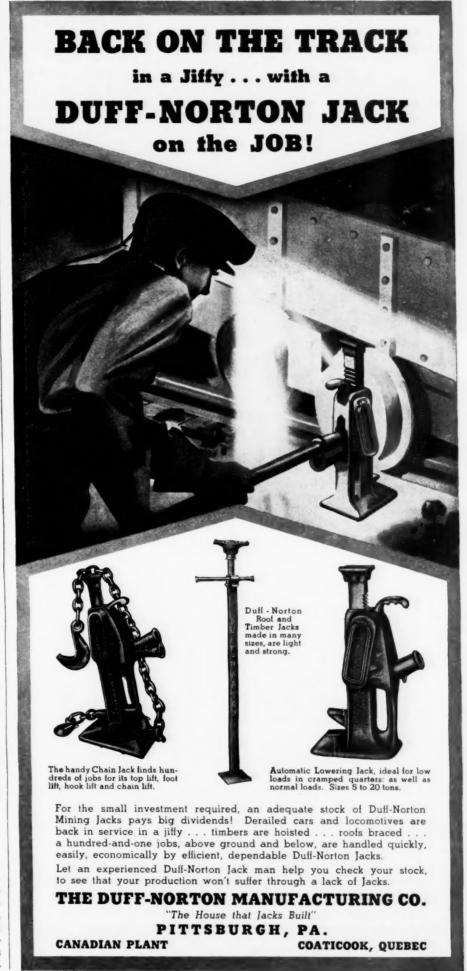
### J. D. A. Morrow Is Dinner Guest Of Business Associates

Officers and executives of the Pittsburgh Coal Co. and its subsidiaries on Aug. 29 gave a dinner in honor of J. D. A. Morrow, retiring president of the company. He had announced his resignation several weeks previously to become president of the Joy Mfg. Co., Franklin, Pa. At the dinner, Mr. Morrow's friends recalled their happy associations with him, some of which began in Washington, D. C., during the days of the World War.

Alan B. Scaife, former chairman of the board, presided as toastmaster and, in behalf of the board of directors, presented to Mr. Morrow a silver loving cup bearing the inscription, "To J. D. A. Morrow from the Board of Directors of the Pittsburgh Coal Co. in appreciation of many years' loyal and efficient service; August, 1940." From his associates Mr. Morrow received a platinum watch and chain and a pair of matched traveling bags.

# May Boost Insurance Rates

O. F. McShane, of the Utah State Industrial Commission, announced during the last month that unless coal-mining companies are able to reduce their accidents, insurance rates will have to be increased and substantially, too, as far as the State Insurance Fund, which was formed to take on workmen's compensation risks, is concerned.







# LAYER LOADING HOIST

The better the product, the easier it is to market, the lower the sales cost, the bigger profits . . . that, in a nutshell, is how this "Brownie" HOIST can help you make more money when used for layer loading. Modern preparation plants use this better loading

method to eliminate an excess of desirable or inferior coal in any single car; avoid segregation of lump from fines; and reduce degradation. Each of the three different sized "Brownie" hoists designed for such service assures excellent results. Why not let us explain this application in detail . . . and send literature describing other items in the line for increasing preparation profits?

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THE BROWN-FAYRO
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In a letter to coal-mine operators Mr. Mc-Shane said, in part: "For the same number of man-hours' exposure, the coal mines kill approximately 8½ times as many people as are killed in the general industrial classes." He also quoted figures to prove his assertion that rates will have to go higher.

# Railroads Refuse to Reduce Anthracite Rates

Nine Eastern railroads refused on Sept. 5 a request by the State of Pennsylvania and the anthracite industry for lower freight rates along the Middle Atlantic seaboard. The refusal, announced at a conference in Philadelphia, was followed by a threat from the State and the industry, fighting to recapture markets lost to other fuels, to carry their fight to the Interstate Commerce Commission.

Participants in the conference were Claude T. Reno, State Attorney General; Richard P. Brown, State Secretary of Commerce; and representatives of the Anthracite Institute and the Independent Anthracite Coal Operators' Association on one side and officials of the railroads on the other.

### Operators Appoint Specialist To Retrieve St. Louis Trade

Southern Illinois Coals, Inc., Chicago, has named James A. Worsham, sales consultant and market research specialist, as public relations manager to work exclusively in the St. Louis area. Companies affected are: Old Ben and Franklin County coal corporations, Bell & Zoller Coal & Mining Co., Peabody Coal Co. and Chicago, Wilmington & Franklin Coal Co.

Mr. Worsham explained: "My job is to retrieve for these important coal mining companies the market in St. Louis from which they have been shut out so suddenly and arbitrarily by the St. Louis smoke ordinance. We desire to make it clear that boycott methods have no place in our thinking. We are not opposed to a reasonable smoke ordinance such as other cities find satisfactory. When the public becomes fully acquainted with all factors involved we are confident that the outcome will be satisfactory to us and the people of St. Louis."

# Preston County First-Aid Meet Closely Contested

First prize in the first-aid contest at the Preston County (West Virginia) Coal Mining Institute's fifth annual safety day, held Aug. 17 at Silver Lake, near Thomas, W. Va., was won by the team of the Davis Coal & Coke Co., Kempton, W. Va., with a score of 99.8 plus. Second prize was won by the team of the Stanley Coal Co., Crellin, Md., with a tally of 99.8 minus.

As usual, the affair was a general picnic, the grounds being filled with miners' wives and children, who closely followed the first-aid contest. Chief judge was Dr. A. L. Murray, U. S. Bureau of Mines. Short talks were

delivered by N. P. Rhinehart, chief, West Virginia Department of Mines; Senator A. G. Mathews, Jennings Randolph, and Dr. J. J. Rutledge, chief mine engineer, Maryland Bureau of Mines. Music was furnished by the City Band of Thomas, W. Va.

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# Trainload Rate of \$2.75 Set On Coal to St. Louis

Fourth-section authority has been granted by the Interstate Commerce Commission to the Missouri-Kansas-Texas R.R. and other roads to establish a trainload rate on coal of \$2.75 a ton from the Arkansas-Oklahoma semi-anthracite district to St. Louis. Hitherto, rates over these lines have been from \$2.75 to \$3.05 a ton.

The affected roads had cited the \$2.75 rate published on May 15 by the St. Louis-San Francisco Ry. and the Kansas City Southern to St. Louis from the same district, which the I.C.C. had refused to suspend. This rate was published following the efforts of the smoke elimination committee in St. Louis to bring a high-grade smokeless fuel to the city to reduce the smoke nuisance. Other roads parties to the application are the Arkansas Western, Fort Smith & Van Buren, and Midland Valley R. R.

The Commission's order stated that the railroads are authorized to establish rates not lower than \$2.75 per net ton on lump or slack coal, also coal briquets, semi-anthracite or smokeless, in quantities of not less than 40,000 lb., from Arkansas and Oklahoma mines to St. Louis over their routes by way of Muskogee, Okla., and Eve, Mo., and thence by way of the M.K.T. and to maintain higher rates from and to intermediate points.

# **Industrial Notes**

New Departure division of General Motors Corporation, Bristol, Conn., announces the following promotions: Ralph O. Wirtemburg, manager of the New York office, has been transferred to the main office in Bristol as Eastern sales manager, a new post; Francis B. Wasley, in charge of the Philadelphia office, has been shifted to succeed Mr. Wirtemburg in New York; Mark Goedecke, service engineer in the Bristol office, has been made chief of the Quaker City office.

OTTO CONSTRUCTION Co., builder of coke ovens and equipment for byproduct recovery and treatment, has established offices at 500 Fifth Ave., New York City.

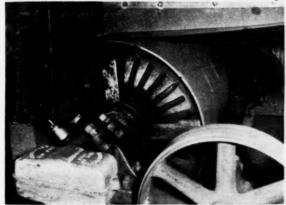
ROOTS-CONNERSVILLE BLOWER CORPORA-TION, Connersville, Ind., has sold its turbine pump business to the Sterling Pump Corporation, Hamilton, Ohio, which will manufacture and sell this line of pumps in the future under its name.

CHAIN BELT Co. announces that its Minneapolis office has been moved to 1645 Hennepin Ave. R. X. Raymond is district manager.

FAIRBANKS, MORSE & Co. is having plans drawn for a new non-ferrous metals foundry 80x220 ft. to be erected at Beloit, Wis.

ALLIS-CHALMERS MFG. Co. has appointed

# TAKES ADVANTAGE OF BENEFITS OF MAGNETIC PULLEYS



• At Seymour Coal Mining Company's Freeman spur mine, the Stearns magnetic pulley is in use at rescreener discharge in preparation plant for removal of all tramp iron from soal.

• Stearns Magnetic Pulley operating on the main 54" dia. lump coal conveyor, where tramp iron and steel is removed from the lump coal at the 1,000 ton per hour coal preparation plant of Bell & Zoller.



At the Bell & Zoller cleaning plant which handles all of the coal from Zeigler Mines Nos. 1 and 2, coal preparation standards are of a high plane. Stearns Magnetic Pulleys are considered a good and sound investment in their effective elimination of tramp steel and iron in addition to providing good insurance against damage to crushing equipment.

Stearns air-cooled, improved, powerful Magnetic Pulleys are available in sizes to fit your conveyor systems or in complete separator units with belt and tail pulley. Our Bulletin 301.

Stearns Suspended Magnets, circular and rectangular to fit your application. Our Bulletin 25.

Stearns Automatic Spout Magnets with safety trap. Bulletin 97.

★ Consult us on your next requirements. Give details as to capacity, plant layout, etc. MANUFACTURING CO.
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# DOOLEY COAL DRILLING EQUIPMENT



# Well Represented at SOUTHERN ILLINOIS MINES

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# DOOLEY BROS. PEORIA, ILL.



DEPENDABLE SERVICE GUARANTEED



Chester H. Norton as assistant manager of purchases. He has been transferred from the Boston works, where he was purchasing agent, to the company's main office, in the Allis works at Milwaukee, where he will assist Fred E. Baker, general manager of purchases. H. W. Hauser, formerly with the company's purchasing department in Milwaukee, will succeed Mr. Norton at the Boston works.

Joy Mfc. Co., Franklin, Pa., announces that Lloyd G. Felderman, who had been chief inspector of the company, has been promoted to planning engineer in charge of arranging work so that schedules will be met.

CHICAGO PNEUMATIC TOOL Co., New York City, announces the appointment of P. J. Christy as manager of its Philadelphia office. He succeeds A. M. Brown, who has been transferred to the newly established Washington branch as manager. C. A. Diehl has been made manager of the Houston (Texas) office.

Porcelain Steels, Inc., Cleveland, Ohio, has appointed Wallace W. Leipner as architectural engineer in charge of sales and engineering of the enameled roofing and siding division. He resigned from the Arthur McKee organization to accept the new position.

TIDEWATER EQUIPMENT & MACHINERY CORPORATION has moved into larger quarters at the Lincoln Building, 60 East 42d St., New York City.

JOHN DELMAR UNDERHILL, vice-president, Okonite Co., Okonite-Callender Cable Co., Inc., and Hazard Insulated Wire Works, was honored with a dinner and reception at the Engineers' Club, New York City, given on Sept. 16 by fellow employees in celebration of his completion of 50 years' service with Okonite. President F. C. Jones presided as toastmaster, and a number of appropriate gifts were presented to Mr. Underhill.

ELECTRIC CONTROLLER & Mfg. Co., Cleveland, Ohio, has appointed C. B. Locke as sales representative with headquarters at Charleston, W. Va. For a number of years Mr. Locke was electrical engineer of mines for the Fordson Coal Co.

#### Arkansas Mine Blast Kills Ten

Ten men, comprising the night force of the Bates Coal & Mining Co., Bates, Ark., near Fort Smith, were killed by an explosion in the shaft 1,700 ft. below the surface soon after starting work on the evening of Aug. 27. Most of the bodies when recovered were badly burned. Ben H. Bedwell, mine manager, said the victims appeared to have been killed instantly.

# Approves Anthracite Canvass

A resolution (H. Res. 564) authorizing the Speaker to name three members to inquire into the anthracite emergency program in Pennsylvania has been approved by the House of Representatives in Washington. The committee will have no appropriation

made for it and will not have authority to subpoena witnesses. As explained in the House discussion, the resolution's purpose really is "to hold some conference in reference to the Pennsylvania situation" with a view to supplementing the Pennsylvania program with Federal action if necessary.

# Colonial No. 3 Shows Way In Pennsylvania Meet

Colonial No. 3 team of the H. C. Frick Coke Co. won the 1940 championship for the Pennsylvania bituminous coal industry at the State's Fourth Annual First-Aid Contest, held at Ebensburg, Pa. The contest was the feature event of the closing day, Sept. 4, of the Cambria County Fair. The meet brought together 44 teams selected at elimination contests held throughout the State.

The order of finish of other teams was: second, Pennsylvania Electric Co. No. 1; third, Koppers Coal Co., Melcroft; fourth, Pennsylvania Electric Co. No. 2; fifth, Hillman Coal & Coke Co., Jerome: sixth, Rochester & Pittsburgh Coal Co., Aultman, Kent No. 1 and Kent No. 2; seventh, Vesta Coal Co. No. 4 mine. There were ties for second, fifth and seventh places, which had to be worked off with extra problems.

### Illinoiser Reappears

The Illinoiser, monthly house organ of the Consolidated Coal Co., Chicago, has been revived after being dormant for some years. The first issue since resumption, dated Sept. l. contains the following announcement under the heading "An Old Friend Returns": "After a lapse of about eight years, Illinoiser, which first came out of the shell in July, 1929, will again be dropping in on you every month or so. We are happy to resume its publication, believing it will receive the same cordial welcome accorded during its former span of three years.'

#### Gaylord Mines to Reopen

Having made the necessary arrangements with the Glen Alden Coal Co., plans have been completed for reopening the Gaylord mines, in Luzerne County, Pennsylvania, by Samuel Bird Sr. and Morgan Bird. The mines, which were closed some time ago by Wasley and Van Buskirk, will be in charge of Samuel Bird, who served for 25 years as a mine foreman with the Kingston Coal Co. Repairs and other preliminaries began early in September and were expected to be completed in several weeks, after which mining operations were to start.

# Miners' Asthma Compensable

Suffers from miners' asthma are eligible for benefits under the 1939 Pennsylvania workmen's compensation law, according to a ruling on Sept. 7 by the State Workmen's Compensation Board. William H. Chestnut, director of the bureau, said that many miners in the State, both anthracite and bituminous, are affected by the disease.



WITHOUT "BLINDING"

SINGLE AND MULTIPLE DECKS

The sharp action of the vibrating body of a SECO screen is not dampened by resilient mountings. The patented equalizer assembly, connecting body to base frame, fully controls the circle throw

To this positive action has now been added a feature, also patented, that is unique in its ability to keep finer meshes from blinding.



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# HOLMES EQUIPMENT

for lower cost mining used in **SOUTHERN ILLINOIS** 



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picture above shows three the five Holms Car Re-ers in use at Pyramid aration plant. At four Pea-y Coal Mines in Southern lois Holmes hoisting equip-t is used to meet rigid uction schedules.



Illinois use Holmes Spirals - no Lowering voids to reduce storage space—save wear

tear — cost nothing to operate — material slides gently onto the peak of the pile without droppage—find out how you can save money with

Write today for this bulletin which gives details and helpful information on cages and hoisting.

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# TRAMP IRON **MAGNETS**



 To be located in chutes, shaker screens, ends of loading booms or conveyors for the certain removal of tramp iron and steel during the processing of coal. They safeguard your machinery from damage . . . and assure clean, metal-free fuel for your industrial or domestic customers.

Three poles, energized by a thoroughly insulated coil. Furnished with sufficient tapped holes for quick and easy installation . . . or made to order for unusual applications. For direct current only . . . 110 to 600

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Patients on the mats and teams awaiting the word "Go" at the Pikeville meet.

### Koppers First-Aid Team Wins In Pikeville Contest

PIKEVILLE, W. VA., Sept. 21-To the Koppers Coal Co. first-aid team, Weeksbury, Ky., captained by Jesse Dale, went the \$100 cash prize for the best score at the annual safety day program held here today under sponsorship of the Big Sandy-Elkhorn Coal Mining Institute and Pond Creek-Tug River Mining Institute. Second prize was won by a Consolidation Coal Co. team from Mine No. 155, Van Lear, Harry McCarthy, captain: third by the Eastern Coal Corporation, Stone, John Cover, captain, and fourth by the Beaver Creek Coal Co., Drift, T. E. Green, captain.

Thirty-eight teams competed in the firstaid contest and two in a mine-rescue demonstration. In the latter, a team from No. 204 Mine, Consolidation Coal Co., Jenkins, John Hill, captain, won with a percentage

Leckie Collieries Co. and was captained by James Miles. Executives of the meet were G. M. Patterson, chief inspector and head of the State

\$60 in cash, came from Aflex mine of the

Department of Mines and Minerals; E. S. Hamilton, president, Pond Creek-Tug River institute; W. A. Eades, secretary-treasurer



Awarding prizes at the Pikeville meet. In the foreground; left, E. S. Hamilton smiles at a prize he is about to hand out; James F. Bryson at the mike has just called the team captains to the platform and A. D. Sisk is passing out another prize,



This Weeksbury team took the Pikeville firstaid honors and \$100 cash. W. R. Campbell, general mine foreman, and his young son are kneeling at the right.

of 96. In the boys' class, first-aid contest, the winner was a team from McRoberts of the Consolidation Coal Co., Warren Flint Jr., captain, and in the girls' class the top notch team, captained by Jessie Hibbits, was from Jenkins mines of the same company. Colored teams competed in a separate class and the team taking first prize,



This colored team from Aflex, Ky., won \$60.



In the mine rescue contest this Jenkins team scored 96 per cent.

of the same; W. R. Campbell, president, Big Sandy-Elkhorn institute, and A. D. Sisk, secretary-treasurer of that organization. W. J. Fene, chief judge, was assisted by J. B. Allen. Announcers were John G. Green and James F. Bryson.

As in the previous year, the meet was held in the city park, which is only one block from the Hatcher Hotel, where the teams were registered. Captains of all teams were awarded prizes consisting of various articles of merchandise. An automobile was awarded to the holder of the lucky ticket among those sold to help finance the meet. Cooperating in the meet were the Big Sandy-Elkhorn and the Williamson operators' associations, U. S. Bureau of Mines, Kentucky Department of Mines and Minerals and the United Mine Workers.

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No. 10

### **New Peabody Cleaning Plant**

A new coal cleaning plant is to be constructed by the Peabody Coal Co. at its Kincaid No. 7 mine, in Christian County, Illinois. The new structure is to handle 1,000 tons per hour and cost about \$250,000. Work on the foundation started early in September, according to company officials.

#### Williams Mining Co. Sold

Property of the Williams Coal Mining Co., near LaFollette, Tenn., was sold to former Sheriff Middleton, of Harlan County, Kentucky, and associates on Aug. 28 on a bid of \$36,000. It is said that the new purchasers will continue operation of the mine. A bid of \$35,000 was offered for junking

### Republic Leases Rainey Mines

Republic Steel Corporation has leased the Clyde mines for 25 years from W. J. Rainey, Inc., Pittsburgh, Pa. The lease covers about 5,000 acres. The mines are in Washington and Greene counties, south of Brownsville, Pa. The mines will be under the management of E. B. Winning, manager of Republic's Northern coal mines. About 6,000 tons of coal is produced daily by these mines and approximately 1,600 men are employed. Coal shipments can be made by either water or rail.

#### A.I.M.E. Plans Meetings

The executive committee of the anthracite section of the American Institute of Mining and Metallurgical Engineers held a luncheon meeting Sept. 7 at the Altamont Hotel, Hazleton, Pa., to plan activities of the section for the coming season. W. H. Lesser, chairman, presided. It was decided to hold three meetings during the season, the first to be held at Wilkes-Barre during the latter part of October.

# Linton-Summit Sinks New Shaft

Linton-Summit Coal Co. is sinking the shaft for a new mine near Linton, Ind. The new operation, which will tap the No. 4 seam at a depth of about 300 ft., will be located near the former Nos. 12 and 17 mines, 3 miles west of Dugger. An official of the company says the new mine will involve an outlay of \$700,000. It will be completely mechanized, with tipple, cleaning plant and latest equipment. About 200 men will be employed and daily capacity will be around 2,000 tons.

#### C. F. & I. Team Wins

A margin of one point out of a possible score of 1,500 made the first-aid team from the Kebler mine of the Colorado Fuel & Iron Corporation, Tioga, Colo., the winner of the safety trophy in the Labor Day safety contest at Trinidad, Colo. The Kebler team scored 1,493 points and Valdez team, 1,492.

# **Trade Literature**

BALL-BEARING LUBRICATION-New Departure Division General Motors Corporation, Bristol, Conn. Booklet A-120 covers selection and application of oils and greases, giving a simple method of determining the proper grade and viscosity of oil for various operating temperatures and bearing speeds and discussing composition and use of greases with reference to their relative suitability under different speed, temperature and moisture conditions.

CUTTER-Mayor & Coulson, Ltd., Glasgow, Scotland. Booklet 3c describes features and advantages of the 15-in. Samson cutter, citing that it is designed to cut hard material reliably and quickly, having controls that are simple and light to use and embodying safety features.

ELECTRIC EQUIPMENT—Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Descriptive Data 3808 pertains to "Simpac" power units for out-of-the-way localities or for specialized industrial applications where a.c. power is not readily available. Descriptive Data 3145 covers a complete line of bullet-type vertical hollow-shaft motors available in squirrel-cage, wound-rotor or capacitor a.c. types, and also for d.c. operation, designed especially for deepwell turbine

ELECTRIC LAMPS-Mine Safety Appliances Co., Pittsburgh, Pa. Bulletin M-9 features the Model E Edison permissible electric flood lamp consisting of six Type M-14

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#### MINING ENGINEERS:

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All information will be held in confidence. Send replies to:

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calls for operating efficiency all along the line. These specialists in various phases of mine operation can aid you materially in determining quick, economical solutions to your mining problems, that make for more efficient operation, resulting in lower costs and a consequent greater return on your investment. Consult them!

Edison cells arranged in a steel battery container, equipped with fuse, Yale-type lock, safety lens and safety bulb mounting. Also described are the company's five standard permissible electric hand lamps, M.S.A. special hand lamps, Edison permissible electric trip lamps, Edison electric mule or cage lamps and rectifiers for charging Edison mine-lamp batteries.

FOUR-WHEEL SCRAPERS—Bucyrus-Erie Co., South Milwaukee, Wis. Bulletin 4WS-3, beginning its story with a review of all the features incorporated in these new scrapers, discusses in detail double-curve cutting edge, balanced weight, positive rolling ejection, controlled depth of spread, etc., with particular emphasis on the way each feature helps give dirt movers faster time cycles and more dirt.

HERRINGBONE GEAR REDUCERS-Link-Belt Co., Chicago. Booklet 1519-A gives up-tothe-minute information on the company's complete line of herringbone gear reducers, pointing out that addition of several new sizes and changes in construction has brought about revisions in both horsepower ratings and dimensions.

INDUSTRIAL DERMATITIS-Milburn Co., Detroit, Mich. Booklet describes causes and means of prevention and protection against industrial skin diseases and enumerates ten different kinds of creams and ointments for specific applications as related to: (1) paints, lacquers, varnishes, greases, etc.;
(2) oils (mineral, animal or vegetable), cutting and drawing compounds and petroleum distillates, or solvents, as well as hydrocarbon solvents and their derivatives; (3) acids and alkalies, either solids or aqueous solutions.

MIXED-FLOW PUMPS-Fairbanks, Morse & Co., Chicago. Bulletin 6360 describes a new line of mixed-flow vertical-propeller pumps said to be particularly suited for use in projects requiring reasonably portable selfcontained pumps. Operating with the pro-peller submerged, they may be suspended in a simple manner from a floor or structure over the water; they may be arranged for electric-motor, diesel, or gasoline-engine

PORTABLE COMPRESSORS - Chicago Pneumatic Tool Co., New York City. Bulletin 758 covers complete line of portable compressors of streamlined design, emphasizing a new 500-cu.ft. model which is dieseldriven.

RUBBER SUCTION HOSE-B. F. Goodrich Co., Akron, Ohio. Catalog Section 4600 contains boiled-down information on Spiralock construction as well as the construction on all types of hose, whether rough or smooth bore, light or heavy wall.

SMALL SCRAPER-R. G. LeTourneau, Inc. Peoria, Ill. Bulletin Form SC-141 deals with Carryalls in sizes from 3 to 11 yd. heaped measure, stressing their use both as utility units and tools to handle entire jobs. Design features and efficient scraper use also are covered.

STEEL GRATING AND STAIR TREADS-Blaw-Knox Co., Pittsburgh, Pa. Catalog 1773 is devoted to electroforged steel grating and stair treads, one section describing the method of manufacturing, also portraying a

# "The BETTER it's tailored the LONGER it wears!"



Kenosha, Wisconsin, Manufacturers of Wire Ropes and Braided Wire Rope Slings for every use. (Distributors throughout the U.S.A.) New York... Pittsburgh...Chicago...Ft. Worth ...Portland...Seattle...San Francisco.

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LABORATORY TESTED—FIELD PROVED

October, 1940 - COAL AGE

# PORTABLE'S CAP LAMP



# Guaranteed to Make Good

Portable's Electric Cap Lamp, distributed under Portable's 12-month contract, is backed by the hardest-hitting, most inclusive guarantees ever known to the industry.

- lst—Portable guarantees that users' light volume will remain constant as long as lamps are in use.
- 2nd—Portable guarantees that batteries will never drop to less than 80% of capacity.
- 3rd—Portable guarantees that our service men will visit each installation once each two weeks, to correct any difficulties.
- 4th—Portable guarantees that you may reduce your lamp requirements at the end of any 12 months' period, without penalties,

Find out about Portable's Cap Lamp—so foolproof, so efficient that it permits us to make these avarantees. Write for complete information.

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for preparing
PREMIUM Stoker Coal



Erecting a "Pennsylvania" BRADMILL for preparing PREMIUM Stoker coal.

Tests made in 3 different types, leading to selection of equipment for preparing 1½"x½" Domestic Stoker coal, indicated approx. 22%, and 16% minus ½" from two types, with varying amounts of oversize, while the BRADMILL test showed less than 9% ½" and no oversize.

With more than \$1.00 differential between Stoker coal, and the  $\frac{1}{8}$ " fines, savings show early amortization of the investment made in the BRADMILL.

On receipt of your Stoker Coal specifications, we will be glad to make recommendations and quotation on indicated equipment.

Ask for Bulletin 8001



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micrographic analysis of the forged structure of the grating. Illustrating a diverse range of uses, the booklet contains a table of safe loads and size variations.

TRACK-TYPE TRACTORS—Caterpillar Tractor Co., Peoria, Ill. Booklet Form 6224, designed to show the part Caterpillar products have played in reducing mining costs, deals with the company's diesel engines as well as track-type tractors. Typical of the work illustrated are culm-bank reclamation, winch work, crushers, overburden removal, diesel-powered hauling locomotives; shovels, work around shovels; and miscellaneous jobs.

Transmission Belting—B. F. Goodrich Co., Akron, Ohio. Catalog Section 2100 contains condensed information on the company's line of transmission belting, describing the process of manufacture and testing of materials and fabrication as the belt is made.

WHEEL-MOUNTED CRANE—General Excavator Co., Marion, Ohio. Bulletin 4018 is a condensed "tell all" story with these chapter headings: lifting capacity, mobility, maneuverability, and stability.

#### Susquehanna Erects New Shop

Susquehanna Collieries Co. has started construction work on a new steel fireproof building 50x130 ft. at the Glen Burn (formerly Cameron) colliery, Shamokin, Pa. The new structure will house the various repair shops at this colliery, which had outgrown the old structure. The old shop will be razed to provide additional space for storage of timber.

### Koppers Wins New River Meet

Stanaford team of the Koppers Coal Co, won first place in the white division at the New River and Winding Gulf Mining Institute's eleventh annual safety meet. Winding Gulf Collieries team was second, and New River Co.'s Mabscott team, third. The Mount Hope team was first in the negro division; New River's Sprague team and Koppers' Helen group tied for second. The 46 teams entered in the contest worked seven first-aid problems.

### Coal-Mine Accident Fatality Rate Shows Sharp Advance

Accidents at coal mines of the United States caused the deaths of 139 bituminous and 7 anthracite miners in July last, according to reports furnished the U. S. Bureau of Mines by State mine inspectors. With a production of 36,080,000 net tons, the accident death rate among bituminous miners was 3.85 per million tons, compared with 2.69 in the corresponding month of 1939.

The anthracite fatality rate in July last was 1.59, based on an output of 4,415,000 tons, against 5.76 in July, 1939.

For the two industries combined, the accident fatality rate in July last was 3.61, compared with 2.97 in the seventh month of the year previous.

Fatalities during July last, by causes and States, as well as comparable rates for the first seven months of 1939 and 1940, are shown below:

UNITED STATES COAL-MINE FATALITIES IN JULY, 1940, BY CAUSES AND STATES

_	Underground										-Opencut and Surface-					
State	Falls of Roof	Falls of Face	Haulage	Gas or Dust Explosions	Explosives	Electricity	Machinery	Other Causes	Total Under- ground	Mine Cars	Electricity	Other Causes	Total Surface	Grand total		
Alabama	2		1			1			4					4		
Arkansas						1			1					1		
Colorado	2								2					2		
Illinois	2		3						5					5		
Iowa	2	0. 4							2					2		
Kentucky	6		2			2			10		1		1	11		
New Mexico								2	2			0.0	4.4	2		
Ohio	2	1					1		4					- 4		
Pennsylvania (bit.)	5		1	63			2	3	74					74		
Tennessee	1		3			1			5					0		
Utah			1						1					1		
Virginia	1	1				* :			2					06		
West Virginia	16		4	2	1	1			24	1		1	2	26		
Total (bituminous)	39	2	15	65	1	6	3	5	136	1	1	1	3	139		
Pennsylvania (anthracite)	5		2						7					. 7		
Grand total	44	2	17	65	1	6	3	5	143	1	1	1	3	146		

	Bituminous					An	thracite-		Total				
	Number Killed		Killed Million		Num Kill		Killed Million		Num		Killed per Million Tons		
Cause	1939	1940	1939	1940	1939	1940	1939	1940	1939	1940	1939	1940	
Underground: Falls of roof and coal Haulage	233 74		1.226 .389	1.117 .426	71 12	59 24	2.377 .402	2.005 .816	304 86		1.383	1.208 .466	
Gas or dust explosions: Local Major	6 28	9 226	.032 .147	$.035 \\ .883$		2	.033	.068	7 28		.032 .127	.038 .792 .066	
Explosives Electricity Machinery	23	14 16 17	.032 .121 .063	.055 $.062$ $.066$	11	5 5 1	.368 .033 .033	.170 $.170$ $.033$	17 24 13		.077 .109 .059	0.074 $0.063$	
Shaft	3 7	1 18 5	.016 .037	.004 .070	9 3	3	.134 .302	.102 .102 .068	7 16	4 21	.032 .073 .032	.014 .074 .024	
Stripping or opencut Surface	16	25	.084	.098		5	.368	.170	27	30	.123 2.438	2.924	
Grand total	412	726	2.168	2.835	124	109	4.150	3.704	536	835	2,400	4	

\* All figures subject to revision.

Pyramid Coal Corp's 30-cubic-yard stripping shovel at Mine No. 1 is equipped with a 1000-ft. length of SUPER SERVICE trailing cable—and is one of many similar installations throughout the strip mining country.



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Whether a thousand-foot 5,000 volt cable for a giant shovel like this, or 600 volt cable for underground mining machines, experience points to SUPER SERVICE as being the all-time, all-popular choice for super-efficiency. There's plenty of reason why—quality from the innermost conductor strand to the hydraulic-press vulcanizing of its Super 6-T jacket compound... Catalog on request.

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October, 1940 - COAL AGE

199

# From Working Jace to Tipple 5KF BEARINGS ARE SPEEDING PRODUCTION

ALL OVER THE PLACE In many of the 212 active Illinois mines that produced 13,440,741 net tons of coal in 1938, BISF Bearings are "all over the place" -on drills, cutters, loaders, locomotives, motors, conveyors, cutters, crushers, screens, fans, drives, pumpswherever there's a place for a bearing.

In Illinois Mines

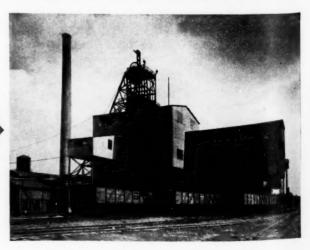
● THE WIDE ACCEPTANCE of BEAFF Bearings in the Mining Industry is due to their ability to keep pegging away despite punishing loads and speeds.

friction bearings used in the Mining Industry. Over a period of years, they have proved their plus-performance.

So today, when stepped-up production is the keynote of preparedness, MAN-UFACTURERS not only select them for new machines, but MINE OPERATORS specify them for replacement as well. They know an ECF is the right bearing in the right place.

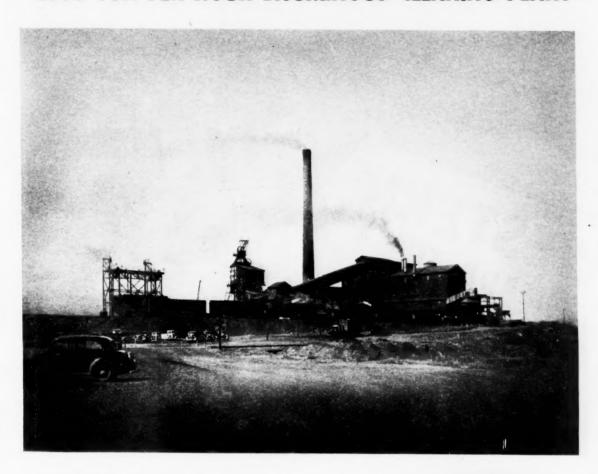
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1000 TON PER HOUR BITUMINOUS CLEANING PLANT



14 BITUMINOUS INSTALLATIONS
BUILT OR BUILDING
RANGING FROM 150 to 450 TPH.

THIS SYSTEM OFFERS THE GREATEST EFFICIENCY & HIGHEST CAPACITY PER UNIT





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October, 1940 - COAL AGE

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 McLaren Coal Co., Pyramid Coal Corp., Sahara Coal Co., Truax-Traer Coal Co., and United Electric Coal Companies—five of the Southern Illinois "model mines" discussed in this issue of Coal Age — are users of Austin-Western Trail Cars.

These and many other modern mechanized mines depend on Western Trail Cars — designed to meet the particular requirements of each mine — because of their established record of economical performance for off-track haulage.

Specially designed axle and fifth wheel construction, ample spring capacity, make Austin-Western Trail Cars able to travel over rough ground at high speed . . . enable them to absorb the most punishing loading shocks without strain. Their distinctive quick-acting, air-controlled clamshell doors open outward and upward . . . permit loads to be dumped on the fly . . . need no clearance space when opened . . . permit hoppers to be filled right to the top . . . make possible round-trip productiveness because their ground clearance permits handling gob for road maintenance or for waste disposal. Ask us to give you performance records. THE AUSTIN-WESTERN ROAD MACHINERY CO., Aurora, Illinois.

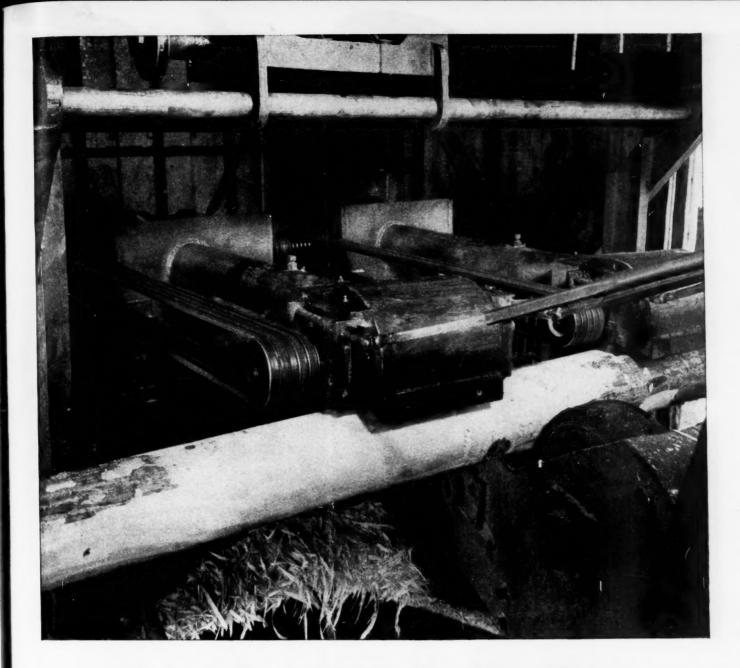
# A Partial List of TRAIL CAR CUSTOMERS

Coal Stripping Co. Enos Coal Mining Co. Hume-Sinclair Coal Mining Co. Rhoads Constructing Co. Binkley Mining Co. Minden Coal Co. Central States Collieries Huntsville-Sinclair Mining Co. Sinclair Coal Co. Hickory Grove Coal Mining Corp. Pioneer Coal Co. Industrial Coal & Iron Co. Central Indiana Coal Co. Maumee Collieries Co. Binkley Mining Co. of Missouri Cahokia Coal Co. The Jefferson Company

Motor Graders
Loaders
Blade Graders
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Crushing and
Screening Plants



Cable Scrapers
Rollers
Roll-A-Planes
Motor Sweepers
Bituminous Distributors
Shovels and Cranes



# It peels a tree faster than you can skin a banana

# A typical example of Goodrich improvement in rubber

To MAKE a sturdy fence or telegraph pole out of a tree the bark is first removed, then the tree must be peeled down to remove knots, stumps of small limbs and enough wood to make it perfectly round. How would you peel a tree?

A southern inventor designed a machine of whirling knives past which a tree is pushed. The knives whisk off the knots and stumps. At least that was the idea. But the knives are driven by a set of rubber-and-fabric belts (V-belts, they're called) and when the flying knives bit into the

wood, the terrible shock snapped the belts like so much string.

Belt after belt was tried. No good. Finally the inventor heard of belts made by Goodrich which are carefully matched under actual operating tension, so that each carries its full share of the load. There are no laggards as in most sets of such belts—the set operates as a team. In addition, they are made with a new Goodrich low-stretch cord for greater strength.

The inventor installed a set of these Goodrich belts, turned on the machine—and held his breath. The pole

went through the knives like a breeze
— outer wood peeled off as easily as
skin off a banana.

The Goodrich belts have lasted for months instead of minutes . . . the same brand of belts you could use for greater strength to drive the machine in your plant—the refrigerator or washing machine in your home.

The B. F. Goodrich Company, Akron, Ohio

# Goodrich

ALL products problems IN RUBBER

(Another story of Goodrich development appears on pages 1 and 161)

October, 1940 - COAL AGE

Scrapers

Rollers

-Planes

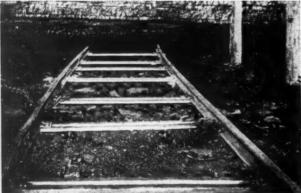
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No. 10

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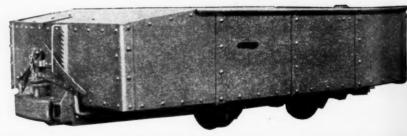


More than twice the butt life in Bethlehem steel ties - In a large Ohio mine, Bethlehem steel ties have shown an average butt life of 10.35 as against 4.56 for wood ties. In addition, the average installation and recovery cost of these steel ties is 7 cents or about one-half as much as that of wood ties.

Bethlehem ties require no spiking, gaging or tie rods. Steel clips permanently fastened to the tie hold the rail firmly; one or two hammer blows lock them in position.

Increased track-laying speed, reduced labor and longer life return many times the difference in the original cost of Bethlehem steel ties. action of the coal and rock laden ground surface.

In many coal field installations, Bethlehem Abrasive-Resisting Steel has had from two to ten times the life of mild carbon steel. It is available in two grades: No. 235 and No. 300; each number indicating the approximate Brinell hardness. No extra treatment is required to bring out the abrasive resisting qualities.



# 1050 Bethlehem Mine Cars for a West Virginia operator

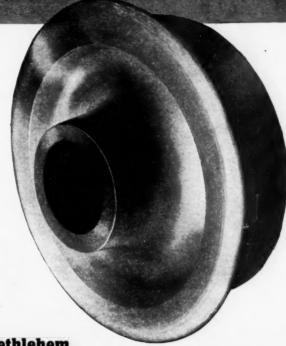
Ten hundred and fifty Bethlehem steel mine cars have been delivered recent to a West Virginia coal operator. These modern, high capacity, stub-axle of are of both rotary and end dump designs.

An order of this size or a small order can be handled by Bethlehem's min car shops with high efficiency and economy.

All parts of Bethlehem mine cars are made in jigs and dies. Punching and shearing templets fix the location of every hole and cut. With this precis handling all parts are interchangeable and will fit without excessive reaming or sledging.

Other Bethlehem Products for the Coal Industry: Rails...Switches, Switch Stands, Turnouts and Special Trackwork...Track Bolts, Nuts and Spikes...Mine Cars...Wheels and Axles...Structural Shapes and Steel Timbering ... Plates ... Fabricated Steel Construction ... Carbon and Alloy Steel Bars ... Forgings ... Castings ... Pipe ... Piling ... Wire, Nails, Fence and other Wire Products ... Pig Iron.

# nean lowered maintenance



# 60,000 Bethlehem Mine Car Wheels without a broken flange or tread

—Since Bethlehem forged-steel mine car wheels were first sold in 1927 there has been no record of one having broken, cracked, or chipped. Approximately 60,000 of these wheels are now in service. Many of them have done four years of single turn and four years of double turn without a replacement.

These wheels are made to A.M.C. standard tread contour and are interchangeable with other tapered roller bearing wheels.

Bethlehem forged-steel wheels cut operating and maintenance costs by eliminating delays and holdups due to wheel failure. They last longer and give all around better service in any installation.

# No timbers needed in this Mayari R dipper

**Stick**—This 10 cu. yd. dipper stick of Mayari R is the first ever used with this shovel that did not require timbers. The Seneca Coal Co. formerly used carbon steel sticks all of which had to be filled solid with heavy timbers to prevent crushing.

Mayari R is well suited for any such job calling for high strength. It has a minimum yield point of 50,000 p.s.i., nearly double that of carbon structural steel. It has from 30 per cent to 50 per cent greater abrasion resistance and from five to six times the atmospheric corrosion resistance of carbon steel.

Mayari R is also used to advantage in mine cars, dump truck bodies, and other mining equipment where deadweight must be kept to the minimum. It is furnished in sheets, strip, structural shapes, plates, bars and cold-formed sections.

BETHLEHEM STEEL COMPANY

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# HIGH INTENSITY MAGNETIC PULLEY INSURES IRON-FREE STOKER COAL!

STOKER COAL business is profitable. Annual stoker sales are steadily increasing—gaining ground while some other types of systems are losing.

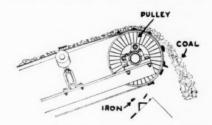
Your dealers can get this stoker coal business, and keep it, if they can give the customers what they are demanding—iron-free coal! You'll have to ship it iron-free from the mines. If you can't, someone else will!

Many producers are meeting this problem with Dings High Intensity Magnetic Separators. The Dings Magnetic Pulley is the most powerful pulley on the market size-for-size. It is built by magnetic specialists—by a firm with 40 years experience in building nothing but magnetic equipment. The Dings Pulley will do an iron-removal job that is impossible with so-called permanent magnets or home-made electrical contraptions. Partial iron-removal is little better than none at all—Dings gives you complete iron-removal.

Dings Separators fit easily into any existing setup. There's a different size and type for each application—for use with belt conveyors, chutes, loading booms, etc. And, every one is scientifically designed to give you maximum iron-removal power.

These units need no attention once they're installed. They stand silent guard, automatically removing every piece of tramp iron or steel that comes to them. You can't buy a more dependable, simple or effective means of shipping coal iron-free from the mines or of protecting crushers. Write for details and literature today.

# Here's How The Pulley Works:



Replacing bead drive pulley on your present conveyor, the Dings Pulley attracts all iron, holds it to the belt surface until it passes underneath and out of magnetic field where it discharges—simple, positive, completely automatic, dependable.



# DINGS MAGNETIC SEPARATOR CO.

535 Smith Street, Milwaukee, Wisc.

Branch Offices in Principal Centers.

# SEPARATION HEADQUARTERS SINCE 1899



# costly electrical circuit changes and breakdowns the G & W

G & W Cable Terminating, Sectionalizing and Protecting devices are the best insurance of the proper maintenance of the underground distribution system of the modern mechanized mine . . . which means full voltage unfailingly to all working places and main hauls in spite of rapid advance and long distance.

Standardize on G & W if you want real distribution facility with the least duplicate emergency equipment. With these devices you will be able intelligently to carry out our forecasts and plans of maintenance and production with the efficiency demanded by mechanical mining—your G & W electrical distribution will keep pace with your operating requirements. operating requirements.

#### **G & W EQUIPMENT INCLUDES:**

#### POTHEADS

High safety factors—generous clearances—liberal designs—accurate fit. All voltages and cable sizes. Various shapes and styles.

#### SUBWAY OIL SWITCHES

Heavy and rugged—use minimum of gasketed joints. High pressure load break contacts require no maintenance.

OIL FUSE CUTOUTS

Type "FC", up to 5000 volts. Stop heavy short circuits within 1/2 cycle. No arcing flame can escape the metal housing. Pressure tight, safety

#### CABLE SUPPORTS

Flexible tinned copper band style. No crushing of cablesheath-adjustable to any cable diameter.

#### BOXES

Watertight—cast iron, cast aluminum, welded steel, also non-cerrosive, non-magnetic, welded stainless steel.

#### SUBWAY OIL DISCONNECTS

Type "RA" multiple-way units. 4 different interconnections of away cable unit with 2 sets of gang-operated links.

# MULTITAPS

For quick, safe, reliable secondary cable interconnections. No tapling-no soldering. In many sizes and forms.

# CABLE COUPLINGS

Disconnecting plug and receptacle style for two or more high voltage cable interconnections.

# G & W ELECTRIC SPECIALTY CO

7782 DANTE AVE., CHICAGO, ILL.

In Canada—Powerlite Devices, Ald. Toronto





# They get the Coal out FAST

825 tons an hour! That's the production at Bankston Creek Collieries. 900 tons an hour come through the preparation plant of Pyramid Coal's No. 1 mine. And 1000 tons an hour are not uncommon at Bell & Zoller Coal Mining Co.

Operators whose profits depend on production like this take no chances in selecting their mine lubricants. They find that the best products are more than justified by increased tonnage.

One way to assure high output at low long-run cost is to keep on hand a complete

supply of Shell Coal-Mine Lubricants and Shell Greases And it's not surprising that so many mines in this highly mechanized region have largely standardized on Shell. (See list at right.)

Shell stocks the oils and greases you need for mine hoists, locomotives, transmissions and conveyor chains...for loading machines, stripping shovels and cutting machines. For dustless treatment, too. The Shell men know their lubricants—and they know which will give smoothest operation for each job in your mine.

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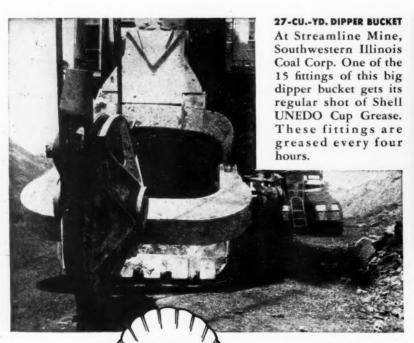
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Shell

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It will pay you to follow the lead of the operators listed here, and let your Shell man make a first-hand study of your lubrication needs—today.





READY TO ROLL—At the New Monarch Mine of Consolidated Coal Co., mine cars are readied for the morrow with Shell UNEDO Cup Grease after the mine has closed for the day.

SHELL COAL-MINE

# in Southern Illinois



# LUBRICANTS

October, 1940 - COAL AGE

# A PARTIAL LIST OF MINES USING SHELL LUBRICANTS

Union Colliery Company, Kathleen Mine. Shell Lubricants are used for mine locomotives and throughout the preparation plant.

Pyramid Coal Corp., No. 1 Mine. Shell Lubricants are used almost exclusively at this strip mine; also throughout the 900-ton-per-hour preparation plant.

Franklin County Coal Company, Royalton No. 7 Mine. Shell Lubricants are used for mechanical loading machines. Also Shell Dedusting Compound "B" is used for dustless treatment of coal.

Southwestern Illinois Coal Corp., Streamline Mine. At this 4,000-ton-a-day strip mine, Shell Oils and Greases are used exclusively in the preparation plant, and Shell Dedusting Compound Grade "C" is used for dustless treatment.

Chicago, Wilmington & Franklin Coal Co., Orient No. 1 Mine. Shell CARNEA 29 Hydraulic Oil is used for the loading machines, and Shell WOLCO Oil 79-J for steam cylinder lubrication.

Consolidated Coal Co., New Monarch Mine. Shell Lubricants are used for mining machines such as cutters, loaders, locomotives, mine cars, etc., including WOLCO 79-J, ALBUS 29 and 34, CARNEA 29 oils and UNEDO Cup Grease No. 2.

Jefferson No. 20 Mine, same company. Shell Lubricants are used for everything on top and below ground, except the three loading machines.

McLaren Coal Company. Shell TALPA 241, WOLCO 77-L, and Golden Shell Motor Oils, as well as CARDIUM compounds are some of the products used exclusively at this strip mine and in the preparation plant.

Bell & Zoller Coal & Mining Co. Shell CARNEA 29 Hydraulic Oil is used for the loading machines; Shell Japonica No. 35 on conveyor chains in preparation plant. Shell Dedusting Compound No. 2 is used for dustless treatment of coal in the 1,000-ton-an-hour coal-preparation plant. Some Shell Lubricants also used for the cutting machines.

# ✓ TO RECOVER WATER ✓ TO PREVENT STREAM POLLUTION ✓ TO UTILIZE FINE SIZES



85 FT. DORR THICK-ENER AT UNITED ELEC-TRIC COAL CO., DUQUOIN, ILL.

Feed: Wash water, fine screen undersize and overflows from fine coal and washed coal boots.

Overflow: Approximately 2300 g.p.m. returned for reuse in constant head tank supplying fine coal plants.

Sludge Discharge: Approximately 35 per cent solids. Screened at 60 mesh with oversize to plant refuse and undersize to pond.

# USE A DORR THICKENER

A Dorr Thickener at your plant will clarify your coal-laden wash water for reuse—will prevent once and for all stream pollution from this source.

If you can market your fines or can burn them in your own power plant, a Dorr Thickener will recover them for you at 50 to 60 per cent moisture, ready for stacking, draining and drying.

Eighty Dorr Thickeners are in use in the anthracite and bituminous fields for these purposes. Sizes range up to 150 ft. in diameter, and capacities to 30,000 gallons per minute.

The picture above illustrates a typical installation. The caption below highlights a specific problem and how it was solved.

If you are confronted with a problem in any way related to the recovery and treatment of your fines, it may pay you to consult a Dorr engineer. You will find his recommendations clear cut and based on facts—in short, refreshingly free from generalities and pure sales talk.

# THE DORR COMPANY

INC.

ENGINEERS • 570 Lexington Ave., New York

ATLANTA

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— DORR TECHNICAL SERVICES AND EQUIPMENT ARE ALSO AVAILABLE FROM THE FOLLOWING COMPANIES:—
NETHERLANDS: Dorr-Oliver, N.V. The Hague - ENGLAND: Dorr-Oliver Company Ltd., London - GERMANY: Dorr Gesellschaft, m.b. H. Berlin - FRANCE: Soc. Dorr-Oliver, Paris
ITALY: S.A.I. Dorr-Oliver, Milan - JAPAN: Sanki Eng. Co., Ltd., Tokya - SCANDINAVIA: A.B. Hedemora, Hedemora, Sweden - AUSTRALIA: Crossie & Duff Pty. Ltd., Melbourne
ARGENTINA: Luis Fiore, Buenos Aires

SOUTH AFRICA: Edward L. Bateman Pty. Ltd., Johannesburg

BRAZIL: Oscar Taves & Co., Rio de Janeiro



REDUCE DUST EXPLOSION HAZARDS

CONTROL DUST . . . . With

# AEROSOL\*

WETTING AGENT

Gives Water More Wetting Power



AT THE CUTTING BAR OF COAL CUTTERS

You can tame the Coal Dust Demon—you can reduce the likelihood of coal dust explosions by CONTROLLING dust with AEROSOL—the wetting agent that makes water WETTER! AEROSOL should be applied, for instance:

1—At the cutter bar of coal cutting machines to wet down fine bug dust.

2—At the discharge end of conveyors, to allay dust.

3—At rotary dumps.

Simply add AEROSOL to the water you pump.

\*\*\*Trade-mark of American Cyanamid & Chemical Corporation applied to wetting agents of its own manufacture."



AT DISCHARGER END OF CONVEYORS

# AMERICAN CYANAMID & CHEMICAL CORPORATION 30 ROCKEFELLER PLAZA, NEW YORK, N. Y.



AT ROTARY DUMPS

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October, 1940 - COAL AGE

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To Our Readers: This 20th Annual Model-Mining Number of COAL AGE has a net paid circulation of 11,391 copies, 14% above last October — and the bighest paid circulation in 16 years!

weeks and interviewed from 1 to 3 officials per mine, to make possible this "trip on paper" for you through the 17 great Southern Illinois Coal producers surveyed herein . . . We acknowledge our grateful appreciation and thanks to the executives, officials and engineers throughout this progressive region whose splendid cooperation and help make this publishing service possible.

Manufacturers with products of increasing importance to the coal industry also turn to COAL AGE these busy days!...

This issue carries over 150 pages of advertising (109% above last October) and representing over 130 manufacturers.

Through October this year COAL AGE has brought its readers over 800 pages of advertising — more information on what to buy and where to buy it than all other U.S.A. publications devoted exclusively to coal mining combined!

- The Publishers



eye protection program. Next time your Mine Safety Appliances Company representative

calls, have him fit some of your miners with American Optical Ful-Vues, and show them the full value received when they "Buy American, By American."



The new improved Ful-Vue Goggle is supplied in 3 eye-sizes, 3 bridge sizes to each

# **American Optical Company**



Factories at Southbridge, Massachusetts 👶



REPRESENTED IN THE COAL MINING INDUSTRY BY MINE SAFETY APPLIANCES COMPANY, PITTSBURGH, PA.

A ROPE
THAT ASSURES
That Assure
That Assures

# MEN . . . SAFETY FOR MONEY

Coal operators who have standardized on Roebling "Blue Center" Wire Rope use it because the test of time has proved that (1) it provides the utmost of protection against accidents; (2) it protects their pocketbooks by assuring lowest rope cost per ton of coal handled. "The operation of today's mechanized mining equipment, at highest possible efficiency, depends to a large extent on dependable, economical rope service. That's why mechanized mines everywhere are turning to Roebling "Blue Center"

In the progressive Southern Illinois field

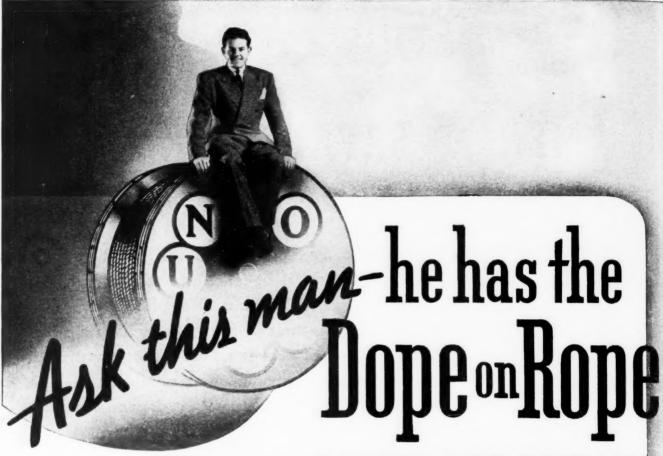
... as in model American Coal Mining regions everywhere, Roebling "Blue Center" Wire Rope and Roebling Advisory Service on current wire rope applications are doing their part, as usual, to contribute to lower cost-per-ton—with safety.

JOHN A. ROEBLING'S SONS COMPANY, TRENTON, N.
New York, Philadelphia, Pittsburg, Cleveland, Chicago, Atlanta, Boston,
San Francisco, Los Angeles, Portland, Seattle, Houston

# ROEBLING "BLUE CENTER" WIRE ROPE



OTHER ROEBLING PRODUCTS INCLUDE Electric Wire & Cable, Cableways & Tramways,
Trolley Wire & Cable, Galvanized Steel Strand, Screen Cloth, Wire Rope Slings & Fittings, Welding Wire & Cable



# He's a trained UNION WIRE ROPE MAN

Many a reel of *quality* wire rope has met an untimely end because it was the wrong rope for the job!...To insure ultimate low cost in wire ropes, we train our salesmen—train them to analyze your problem intelligently. Then, on the basis of their analyses, our experienced Engineering Staff makes sound recommendations. This service costs you nothing—but often cuts the costs of wire rope installations. To reach the Union Wire Rope Man in your territory...

WIRE-WRITE-or consult your Telephone Directory

### UNION WIRE ROPE CORPORATION

GENERAL OFFICES AND FACTORY:

2130 Manchester Kansas City, Missouri

Distributors in Leading Cities throughout the Country



Send us your name and address—and we'll mail you each issue of this periodical, informative bulletin. "Rope Dope" is not an advertisement. It's cold facts that every wire rope buyer should know.

regularly?





Don't have any doubt about the dependability of your wire rope fastenings: CROSBY CLIPS ARE SAFE.

Dealers with all sizes in stock in all principal cities

AMERICAN HOIST & DERRICK CO.



### Does Your Coal Meet Specifications?

There's only way to be sure about the quality of your product, day by day, and that is by constant testing in a properly equipped laboratory.

The WISE Laboratory Coal Crusher prepares coal for testing with unequalled speed and economy. Capacity of 25 lbs. per minute through 3%" screen is achieved with 3% hp. motor operating at 2500 r.p.m. WISE Laboratory Crushers, although a comparatively new product, are already used and endorsed by some of the most prominent coal testing organizations in the United States. Write today for complete information.

O. B. WISE CO.

Knoxville, Tenn.





### COAL CRUSHERS



We build a type and size for every coal crushing requirement. 100 years of experience is your assurance that we know how. Quotations on request.

McLANAHAN & STONE CORP.

Established 1835

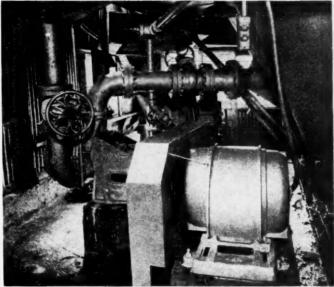
10

HOLIDAYSBURG, PENNA.

### Consider the Facts

Industrial Planning constitutes in part the selection and application of proper equipment for a specific duty.

Illustrated below is what we consider an example of sound industrial planning. The picture shows an installation which exceeded expectations and resulted in a duplicate order for the second washery installed by our customer.



The service was handling sand and water mixtures in a modern preparation plant.

The requirements were economy of operation in every respect.

The customer recognized the following facts:

- 1. The internal wearing parts of the pump should be readily removed for inspection or repairs.
- The pump should be easily adjustable to compensate for wear and maintain capacity.
- Some efficient means must be provided to change pump capacity. Throttling by means of valves must be avoided.

Accordingly a Goyne Type 1609 Sludge Pump with a Variable Speed Drive was selected and found to be entirely satisfactory.

Consider these facts before you purchase your next washery pump.

All inquiries receive prompt and careful attention.

### THE GOYNE STEAM PUMP CO.

ASHLAND, PA.

# Gust Out... Order Your Copy NOW!

### OTHER CONTENTS OF CON-STANT REFERENCE VALUE

Coal fields of the United

Coal Cleaning: Why? Cost? Effect on quality.

Dealer help suggestions.

Dustproofing.

Fifteen chemical and physical properties of coal in individual mines, producing areas, seams.

Selection of coal by industrial consumers.

Bituminous coal price regulation.

# Most Complete National Directory of the Coal Mining Industry Ever Issued

CONTENTS OF DAILY IMPORTANCE TO YOU!

- 1. "Who's Who" in executives, operating and engineering personnel at every coal mine of consequence in the United States and Canada 509 more mines than any other directory published to date.
- 2. Principal equipment and preparation facilities of all these mines (classified by States and seams).
- 3. Seam analysis range analyses of face samples and companies mining seams.
- 4. Stokers a complete directory of stoker and heating equipment manufacturers.
- 5. Maps of each State showing coal producing areas.
- 6. Classification of coals technical data on composition, classification and characteristics.
- 7. Special anthracite section.
- 8. Alphabetical list of coal trade names.
- 9. Directory of coal sales organizations, wholesalers distributors sales agents.

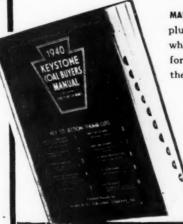
Leading Retailers — over 7,000 of them, look to this national authority for their information on coal.

### MAIL THIS for your copy TODAY!

KEYSTONE COAL BUYERS MANUAL: Enclosed is my check — money order — for \$5 for one copy of 1940 Keystone Coal Buyers Manual including Directory of Mines.

Address

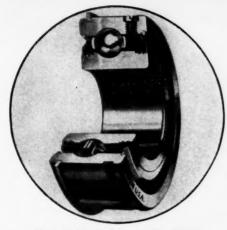
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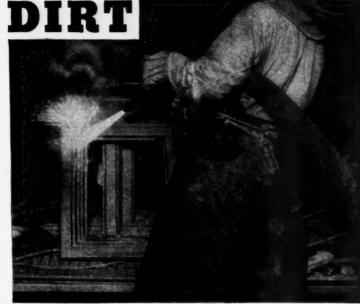
MANUFACTURERS NOTE: This book plus geographical supplement is what you and your salesmen need for sales calls and follow-up. Further information on request.

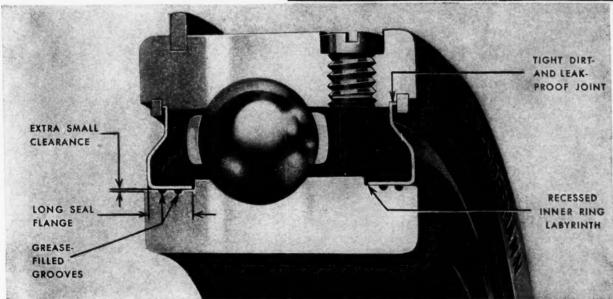
Operators please note — If your operations or personnel are changing, ask for blank to enable us to correctly list you in our 1941 edition records.

FULLY PROTECTED
AGAINST DIRT



Made to Standard Double-Row Widths
WITH 100% GREATER GREASE CAPACITY





A clean, well-lubricated bearing is practically wearless. Dirt, however, will relentlessly destroy it. KEEP DIRT OUT AND KEEP THE GREASE IN, and you are protected against noise, rejections, and premature wear.

In the illustration herewith, note the five distinctive features that exclude dirt from the "CART-RIDGE" BALL BEARING. That minute clearance between the long seal flange and recessed inner ring is ALWAYS filled with grease. The grease grooves in the inner ring are so many added "dams" against the entrance of dirt.

Thus, without any additional closures, the in-

tegral "CARTRIDGE" seals KEEP THE DIRT OUT AND THE GREASE IN—regardless of the position of motor or unit. In assembling or disassembling in the shop, the "CARTRIDGE" BALL BEARING STAYS CLEAN because its internal parts are never exposed.

Adopt the "CARTRIDGE" BALL BEARING as insurance against dirt and grease contamination, and against neglected lubrication. It eliminates numerous supplementary closure parts and machining operations and variables, and speeds up production; and it has convenient regreasing and inspection features.

Write for the Catalog. Let our engineers work with yours.

NORMA-HOFFMANN BEARINGS CORPORATION, STAMFORD, CONN., U. S. A.

Whatever your job may be-When you was a look for it in COAL MINING CATALOGS.

Look for it in COAL MINING CATALOGS.

General Superintendent

Consulting or Construction Engineer

**Electrical Engineer** 

**Purchasing Agent** 

Mine Superintendent

Preparation Plant Engineer

WORLD'S MOST COMPLETE CATALOG

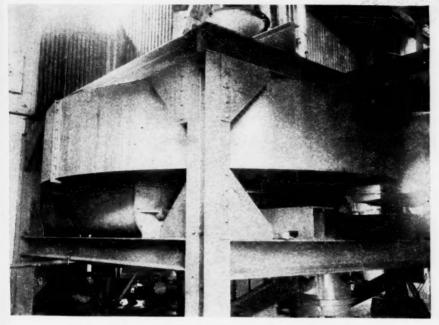
OF EQUIPMENT AND SUPPLIES FOR

LOWER COST COAL MINING.

Mine Electrician

... In One Handy Volume

# Find out how valuable the Centrifugal & Mechanical Dryer can be to you in saving waste and



Continuous Centrifugal Dryer used for reclaiming cleaning and drying minus 10-mesh coal at preparation plant of Delta mine.

# Used at Preparation Plant of Delta Mine for reclaiming and drying minus 10-mesh coal



The Delta Mine is among many that are using the Continuous Centrifugal Dryer. In this unit you have an economical solution to the problem of coal drying without the use of HEAT. You can either dry your  $\frac{3}{8}$ " to 0 washed coal or reclaim the sludge from your washery. You can turn your

sludge into a salable product at low cost. You can reduce moisture and ash content and remove coal from slurry, making large daily savings. You save on power costs—on maintenance, on equipment and building investment and you speed up the work. One company writes, "The feed to the machine is  $^{1}\!4$ " x 0" coal with an entering moisture content of 35%, which is reduced to 6% free moisture."

## increasing tonnage

# FREE DEMONSTRATION

with mobile unit

★ We have a demonstration truck upon which is mounted a 26" Continuous Centrifugal Dryer. This truck is routed to various mining districts in accordance with requests received.

We shall welcome your request for a free demonstration with this demonstrating unit. All we ask is an opportunity to show you what this modern costsaving unit will do with no expense whatsoever to you. Use the coupon now.

### COUPON

Centrifugal and Mechanical Industries, Inc. 146 President St., St. Louis, Mo.

We are desirous of having a free demonstration made to see what your dryer will do in recovering coal from slurry. Route your truck to our mine.

Name		 
Company	Title	 

### CENTRIFUGAL AND MECHANICAL INDUSTRIES, INC.

Main Office & Plant: 146 President St., St. Louis, Mo.

Branch Office: 1003 Sycamore Bldg., Terre Haute, Indiana

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# FAIRBANKS · MORSE



# MOTORS

DIESEL ENGINES ELECTRICAL MACHINERY RAILROAD EQUIPMENT WASHERS-IRONERS STOKERS PUMPS FAIRBANKS SCALES WATER SYSTEMS FARM EQUIPMENT AIR CONDITIONERS



# CONG, SAFE SERVICE at LOWEST COST---



Anderson charging plugs and receptacles on rubbertired haulage unit, Blue Bird No. 6 mine.



Anderson charging plug in use charging batteries of Mancha locomotive, Bell & Zoller No. 1 mine.

ANDERSON Plugs and Receptacles are "standard" throughout the mining industry—on shuttle cars, locomotives, power shovels, and all types of electrical mining machinery.

In fact, wherever there is mechanized mining you will find ANDERSON Plugs and Receptacles on the job—doing their part to cut costs and maintain uninterrupted production. ANDERSON Plugs and Receptacle connectors are specially built to withstand the severe service of mining. Their rugged construction assures long life—and they are safe to use—one type being approved by the U. S. Bureau of Mines for "permissible" equipment.

Other Anderson Mine Products include—Air-Flow Relays for mine ventilation control. Heavy Knife Switches. Circuit Breakers, Insulators. Automatic Time Switches. Overhead Line Material, Cable Connectors, Etc. Write for further information.



Anderson Charging Plug used on "Exide" tronclad Battery for Joy Shuttle Cars at Buckhorn Mine.



Anderson Charging Plugs in use for charging battery of 5-ton locomotive in Mine No. 1 of Bell & Zoller Coal Mining Co., Zeigler, III.

### ALBERT & J. M. ANDERSON MFG. CO.

289-305 A Street, Boston, Mass.

New York

Chicago

Philadelphia

London



October, 1940 - COAL AGE

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Do flway

RAIL JOINTS





Above: Thermit Welded track at Princeton Mining Co., Princeton, Ind.

Left: Welding rails into long lengths at Gauley Mountain Co.

# ... and forget rail joint MAINTENANCE

Because Thermit Welded Continuous Rail increases rail life and reduces track maintenance costs, it soon pays for itself. There are no gaps for wheels to pound, no rail ends to batter; there are no plates to crack or loosen, no rail bonds to corrode; there is nothing to require attention at any time.

Thermit Welds reduce power costs, too. By eliminating power loss at joints they give 20% greater conductivity than jointed rails. Because of the excellent electrical characteristics of the Thermit Weld, combined with the smooth-riding qualities of continuous rails, considerably less power is required at all times to haul trains over welded track. There is no swaying or jolting of cars; derailment and spillage of coal are reduced to a minimum. More efficient operation of haulage lines is assured because of the higher operating speeds that become possible. Maintenance cost of equipment is reduced because wear and tear on the cars and locomotives is less. Write for details.

# THERMIT Rail WELDING



METAL & THERMIT CORPORATION • 120 BROADWAY, NEW YORK

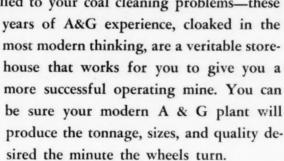
ALBANY • CHICAGO • CINCINNATI • DETROIT • MINNEAPOLIS • PITTSBURGH

SO. SAN FRANCISCO • TORONTO

# 15 Years in our organization and yet he's the youngster

• One of our engineers is a youngster in terms of years of service in this organization but back of him are added years of study and experience—his knowledge of the coal cleaning problems of the industry is extensive—he is seasoned. He works side by side with other Allen & Garcia engineers whose service records with this organization are as high as a quarter of a century.

In short, this is an organization of experience and it takes long-time engineering experience to make available such a service as A&G offers and years of successful operation in the field to keep such a staff intact. This deep-rooted knowledge of coal mining conditions is highly valuable today when applied to your coal cleaning problems—these



We do not attempt to submit the lowest bid but confine our efforts to producing the most results per dollar you invest in your coal cleaning plant.

Consult us regarding your next coal cleaning problem.

# Another A&G plant goes up in Southern Illinois

Allen & Garcia is now erecting the new coal preparation plant at Orient Number One mine of Chicago, Wilmington & Franklin Coal Company. This plant will have a capacity of 520 tons per hour and produce all required sizes to meet their market demands. Chicago, Wilmington & Franklin Coal Company has been a client of Allen & Garcia for 20 years.

Ninety Per Cent (90 %) of Allen & Garcia's Volume is Repeat Business—A True Indication of Work Well Done.



# ALLEN & GARCIA

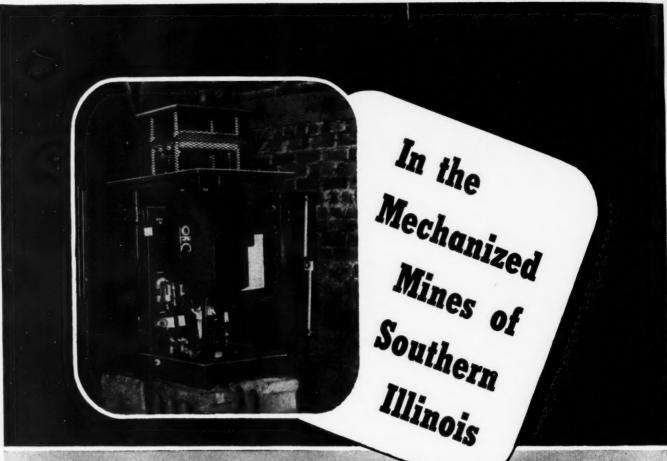
CONSULTING AND CONSTRUCTING ENGINEERS

McCormick Building

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**CHICAGO** 

No. 10



# AUTOMATIC RECLOSING SECTIONALIZING CIRCUIT BREAKERS

The Southern Illinois field was the first to adopt mechanization and therefore was the first to recognize the advantages of sectionalized mining.

Experience of electrical engineers in Southern Illinois mines was helpful in the development of sectionalizing circuit breakers and contributed to the dependable performance of today's Type KSC circuit breaker.

The Type KSC has been dominant in sectionalized mining since the inception of the art.

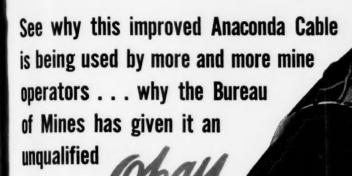
Illustrated above is a typical installation of a 1600 ampere, 275 volt, Type KSC Automatic Reclosing SECTIONALIZING Circuit Breaker in the Valier Coal Company mine at Valier, Illinois.



Representatives in Principal Mining Areas

I-T-E CIRCUIT BREAKER CO., PHILADELPHIA, PA.

# A mining cable with no superior— SECURITYFLEX



Utmost flexibility herringbone compensating construction. Seine twine reinforcement webbing —prevents tearing of jacket.

Sunex Securityflex 60% rubber belt — abrasion, water, acid and alkali resistant.

40% high grade insulation.

### LOCOMOTIVE GATHERING OR REEL CABLE

Sunex Securityflex Cable should be used on all movable equipment for temporary installations in locations where conductors are subject to severe abrasions, blows, reeling and unreeling. The single conductor locomotive gathering cable is constructed with a view to safety, flexibility, tensile strength, resistance to abrasion and the action of mine water.

The center rope of the strand has a mastic covering which effectually prevents shifting of the individual ropes in the strand, and equalizes the tension through all the ropes of the cable.

## SUNEX SECURITYFLEX FOR ALL TYPES OF CORDS AND CABLES

Securityflex with the famous Sunex jacket is made in all types of constructions for every purpose...voltages from 300 to 7,000, shielded and unshielded, and with single or multiple conductors in different strandings for different degrees of flexibility.



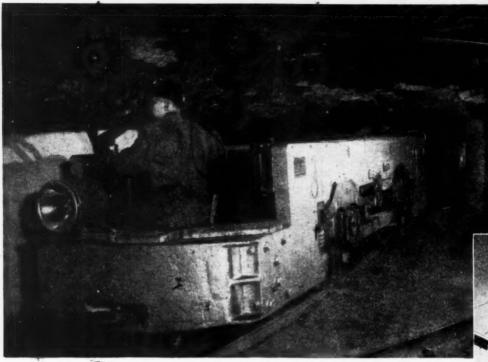
USE MODERN IMPROVED

No. 10

maconda Wire & Cable

ANACONDA WIRE & CABLE COMPANY, General Offices: 25 Broadway, New York City; Chicago Office: 20 North Wacker Drive Subsidiary of Anaconda Copper Mining Company. Sales Offices in Principal Cities

# KEEP YOUR RE-WIRING COSTS DOWN



### **USE G-E DELTABESTON WIRES AND CABLES**

The re-winding of motors and re-wiring of mine locomotives can represent a large outlay if it's necessary to do this work often.

Repeat re-winding jobs on the same motor are few and far between when you use Deltabeston or Deltaglass Magnet Wire. They successfully resist high temperatures, moisture and severe abrasion. They're smooth and easy to handle.



### DELTABESTON MAGNET WIRE



### DELTAGLASS MAGNET WIRE

Deltabeston Mine Locomotive Re-wiring Cable will help you keep locomotive re-wiring jobs to a minimum. It's dependable, easy to use, stands extreme heat, won't absorb moisture or oils, and has a flame-proof overall braid. \*



### **ACT NOW!**

If you want to make re-wiring jobs rare in your mine, get a copy of the G-E Deltabeston Catalog. Write to Section Y-0140, Appliance and Merchandise Dept., General Electric, Bridgeport, Conn.



# LET YOUR TIMBER WEAR OUT NOT ROT OUT

# SPECIFY (0

# CHROMATED ZINC CHLORIDE

TOT TIES, PROPS, SAFETY DOORS, TIMBERING

Timbers treated with Du Pont Chromated Zinc Chloride do not rot out and it's hard to wear them out. Operating records prove that treated timbers have a life expectancy exceeding 15 years. The life of untreated timbers averages not more than 21/2 years. The cost of treatment is more than compensated in avoiding even one replacement.

HAULAGE

In addition to decay resistance, timber treated with DuPont Chromated Zinc Chloride is fire retard-

ing, clean and odorless, permitting safety in handling and avoiding confusing odors foreign to mines. Timber treated with Du Pont Chromated Zinc Chloride is not only efficient and economical underground, but provides economical service above ground for flooring. steps, fencing and mine village houses. For in addition to other characteristics, it is also termite repellent.

Check your replacement costs. You will find it a good investment to use timber treated with Du Pont Chromated Zinc Chloride both underground and above ground.



GRASSELLI CHEMICALS DEPARTMENT WILMINGTON . DELAWARE



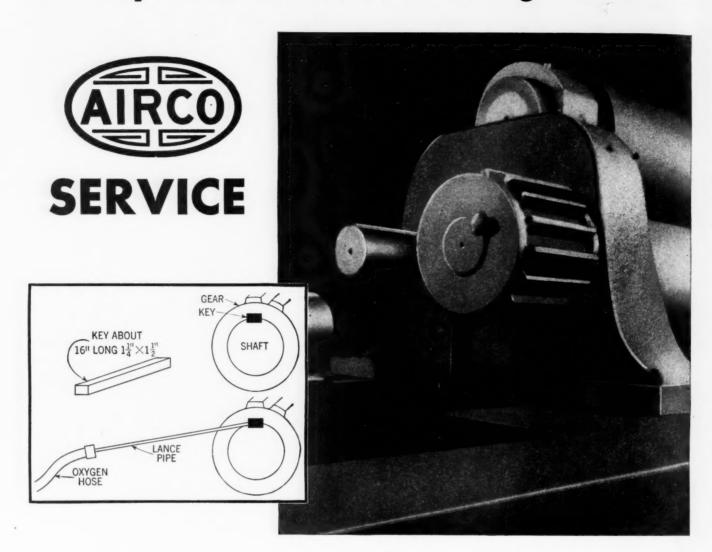




October, 1940 - COAL AGE

10

# The Key to the Solution of a Tough Problem



A gear housing broke on a large Pyramid Roll in the Baker Manufacturing Company, Springfield, Illinois plant. In order to repair the housing it was necessary to remove a large pinion from an eight-inch diameter shaft.

Usual methods had been of no avail and the management knowing that Airco makes a specialty of tough jobs called in the Airco Service Supervisor. Using an oxygen lance the key holding the gear was quickly removed after which the eight-inch

shaft was straightened by heating with an Airco torch. All of this in less than one hour's time. The pinion was then pressed back on the shaft and the machine restored to normal operation. The management was amazed that the job was accomplished in such short order.

If you are not fully benefiting by all the economical, speedy oxyacetylene processes, call us for Airco service. We may also have the key to the solution of your problem. » » Write for full details.

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For more than 50 years, RU-BER-OID Heavy Duty Insulating Tape has been known to mine operators and workers, for the thorough, time-saving, money-saving job it does.

Adhesive on both sides — it stays put, gives lasting protection. Amazingly strong and tough — it takes hard

pulls. Resists abrasion. Sharp coal, oil and grime, have little effect. Acids, alkali, moisture and tem-

perature have no effect. And, because of extra thickness and dielectric strength, one covering provides thorough insulation.

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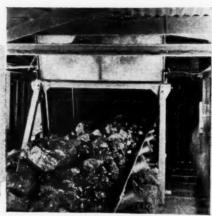
Please send test sample RU-BER-OID Insulating Tape.

October, 1940 - COAL AGE

# Here's how Southern Illinois Mines solve coal handling problems · · · ·



This Weightometer at Bankston Creek accurately weighs the entire incoming feed to the preparation plant on the run-of-mine belt. 1200 Tons per hour



In the modern 1000 Ton an hour cleaning plant of Bell and Zoller Coal Mining Co. at Zeigler, Illinois, this Merrick Weightometer accurately checks tonnage fed into the plant from the No. 2 mine.



conveyor (for limited space) weighing washing efficiency in preparation capacity 250 tons arrow Months.



The chart recorder above is a remote Merrick Rateograph to record on daily chart forms the tonnage of feed to preparation plant at Harco No. 47. Coal is weighed on a Weightometer with capacity of 600 Tons per hour.

The captions on these photographs indicate some of the uses of Merrick Weightometers in leading mines of Southern Illinois—

They're weighing while conveying without weighman - - with - -

# MERRICK WEIGHTOMETERS

This modern method of keeping a constant check on production is typical of the practice followed in the many plants where Merrick Weightometers are in use. By accurately and economically weighing, registering and recording the tonnage handled by belt conveyors every hour of the day, Merricks assure substantial savings in production control and in material handling. Short Pivoted Weightometers equipped with a magnetic pulley serve the further purpose of separating tramp iron.

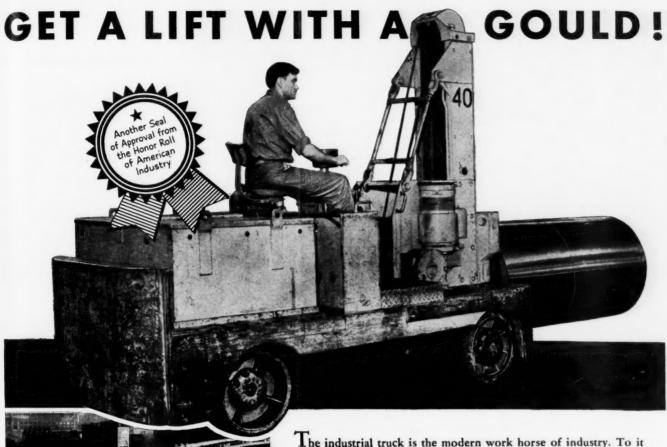
Ask Merrick engineers to show you how you, too, can profit from the use of Weightometers and how easily they can be applied to any size or style belt conveyor, inclined or horizontal.



To weigh and record the refuse from the preparation plant at Bankston Creek, this Tons per hour Weightometer is placed on the refuse belt. A check is thus kept on the refuse produced.

MERRICK SCALE MFG. CO.

Passaic... New Jersey



The industrial truck is the modern work horse of industry. To it go the tough jobs of production—lifting the dead weight of steel, holding it, moving it, putting it down again—shunting freight cars, loading them, shunting them again. Tough jobs call for a tough battery—one with ample margins of power and stamina.

That's why Goulds operate the trucks owned by the American Hoist & Derrick Company of St. Paul, makers of electric winches, road building machinery and the famous Crosby clip. That's why you will find Gould batteries in every industry, doing the hundreds of tasks that demand extra power, longer life, greater dependability.

And that's why Gould is the battery picked by engineers.



ON THE "400", new CNW streamliner, Goulds run air conditioning units.

# For Over 40 Years Gould Has Made Batteries for Every Industrial Application!

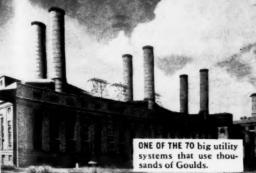


GOULD PLANTE: Guaranteed 14 years in floating service. Maximum life with highest sustained capacity under all operating conditions made possible by exclusive one-piece pure lead spun plate process.



GOULD KATHANODE: Guaranteed from 4 to 12 years. Spun Glass construc-

Guaranteed from 4 to 12 years. Spun Glass construction provides long life, light weight and high capacity at low operating cost. For all motive power and railroad applications.



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FREE illustrated manuals describing any of these exclusive Gould constructions are yours upon request. Write: Gould Storage Battery Corporation, Depew, N. Y.

GOULD

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Depth of Drilling . . . 7 Feet

8 Holes Per 25 Foot Place

10 Places—80 Holes Per 7 Hour Shift

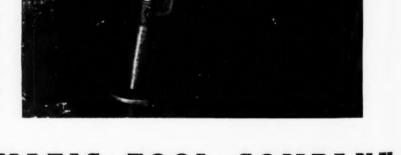
Depth of Drilling ... 9 Feet

10 to 12 (24 ft.) Places Per Day

\* \* \*

Average: 65 Holes Per 7 Hours

These are typical performances of CP No. 472 and CP No. 473 Electric Coal Drills in two Southern Illinois mines, Illinois No. 6 seam. » » Write for catalogs describing the fourteen models of CP Electric Coal Drills . . . Post Mounted . . . Hand Held . . . Open . . . . Permissible.



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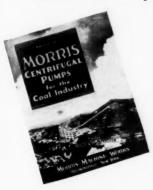


# ELECTRIC COAL DRILLS

**MOUNTED - UNMOUNTED** 



This bulletin tells the story



Write for Your Copy

October, 1940 - COAL AGE

10

THE coal industry of Illinois knows from ample experience that Morris Centrifugal Pumps stand up under the scouring action of coal, sand and sludges . . . the corrosive action of acid mine water . . . the demand for continuous operation over long periods . . . and have ample reserve capacity for emergencies.

Morris makes an exactly suitable type of pump for every service in coal mining, cleaning, handling, reclaiming, and general plant purposes. Moreover, Morris designs are based on 76 years of experience in specializing on abrasive-handling duties. You are safe when you standardize on Morris.

MORRIS MACHINE WORKS . . . . Baldwinsville, N. Y.

Branches in principal industrial centers-Export Office, 30 Church St., N. Y.

ORRIS CENTRIFUGAL PUMPS HERE'S THE

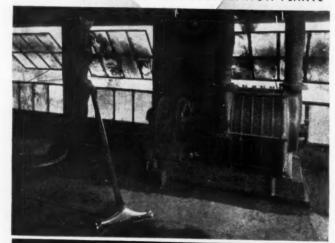
# DUST REMOVAL

EQUIPMENT USED IN THE MOST MODERN PLANTS OF

Hoffman heavy duty vacuum cleaning equipment, installed in a number of plants in the Southern Illinois area, keeps wall surfaces, overhead piping and structures as well as floors free from the hazards of coal dust accumulations. Hoffman engineers will survey your plant-offer recommendations for efficient, economical cleaning systems without charge.

HEAVY DUTY INDUSTRIAL VACUUM CLEANING EQUIPMENT

LET US SHOW YOU WHAT HAS BEEN ACCOMPLISHED WITH OUR UNITS IN COAL PREPARATION PLANTS



CORPORATION

AIR APPLIANCE DIVISION . 105 FOURTH AVE., NEW YORK

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Here is a complete digest of the best practice of the leading coal mining engineers of the world. No one man could hope to learn by experience alone the many facts assembled in this book. With this volume handy, you have ready for instant reference the answers to thousands of questions—dependable facts on every part of your work.

Here is a book that will save time and effort prevent expers

and effort, prevent errors, give the day-to-day help you need toward a better mastery of your job and more rapid advancement.

Twelfth Edition

### Coal Miners' Pocketbook

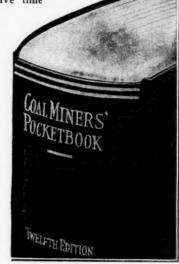
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THIS great standard ref-erence work covers every phase of coal mining, from prospecting to preparing coal for the market—from scientific fundamentals to mine ventilation and drainage. Cutting, loading and conveying machinery is described. Hundreds of practical methods and tips on mine working, erecting tim-bers, hoisting, haulage, etc. — elements of mathematics, mechanics, hydraulics, etc.— tables, definitions, formulas, charts and illustrations in profusion-over 2,000 facts that you need constantly have been assembled by experts in handy form in this book.

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-boilers
-steam engines
-compressed air
-internal combustion engines
-electricity
-power transmission

-electricity
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opening a mine
methods of working
explosives and blasting
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# JONES DRIVES Jor the coal industry

If you have problems involving the application of speed reducers and other transmission products to belt and scraper conveyors, bucket elevators, feeders, railroad car dumps, loading booms and similar services, we believe you will be interested in the Jones bulletins and catalogs listed below.

This technical literature plus a vast amount of data in our files cover most of the drive problems likely to be encountered in the production and preparation of coal.

The accompanying illustrations show some typical applications of Jones drives in leading mechanized mines in Southern Illinois. In the preparation plants of Bell & Zoller Coal Mining Company, Peabody Coal Company, Pyramid Coal Corporation and the United Electric Coal Company, Jones drives are extensively used. At the Ziegler preparation plant of Bell & Zoller, for example, some 25 Jones speed reducer units ranging from 5 Hp. to 100 Hp. are in service.

In every coal mining field you will find Jones drives standing up under the severest punishment of present day production schedules. We believe you will want to know more about how and why these drives can "stand up and take it." A line from you will bring any of the bulletins or detailed information on any drive problem that you may have.



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CUT AND MOLDED TOOTH GEARS • V.BELT SHEAVES
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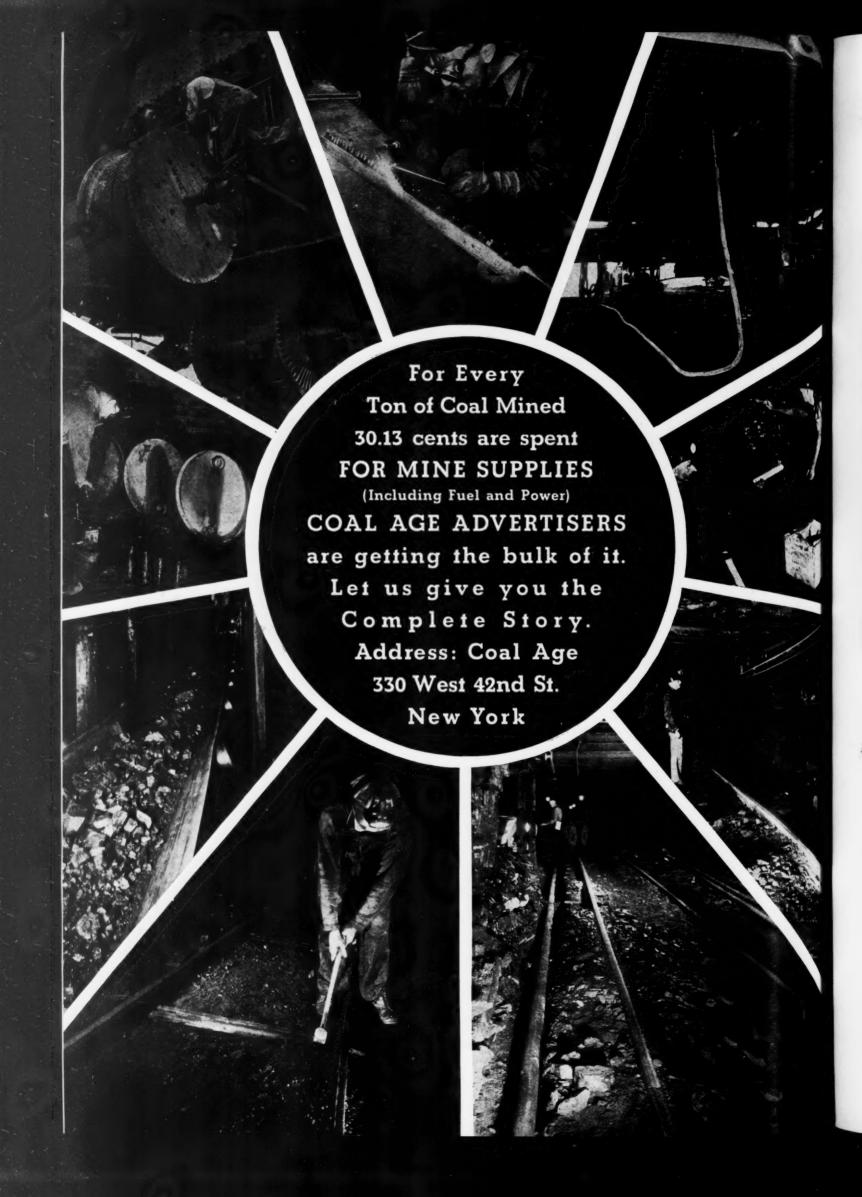
 Jones speed reducer, driven by 10 Hp. V-Belt drive, on raw coal by-pass conveyor belt in Harco No. 47 preparation plant of the Peabody Coal Co.



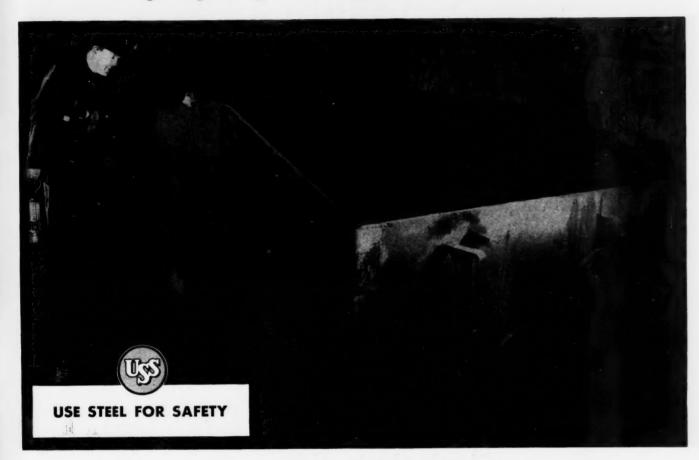
• Jones speed reducer, ratio 33.1 to 1, at 1160 r.p.m. on a 40 Hp. motor through a V-belt drive at Harco No. 47 mine preparation plant of the Peabody Coal Co.



● 150 Hp. motor driving the main 54 in. diameter lump coal conveyor through Jones speed reducer and another spur gear drive at one of the properties of the Bell & Zoller Coal Mining Co.



# MAXIMUM PAYLOADS roll out faster in properly designed steel cars



High speed mechanized production—peak schedules—make it imperative to remove material from the face fast. This calls for mine cars designed for the largest possible capacity with a minimum of dead weight—durable cars, that will stand up under constant, rough usage.

Carnegie-Illinois has been building such cars for over twenty years in every conceivable size and type. Our engineers are specialists in designing cars that will have the utmost capacity possible within the dimensional limits of your mine. They are able to reduce dead weight, to provide protection against corrosion and excessive wear, by taking advantage of U·S·S Special Steels in mine car construction.

It will pay you to investigate the advantages of U·S·S Mine Cars. Why not discuss your requirements with a Carnegie-Illinois engineer? His services involve no obligation.

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U·S·S STEEL ROOM TIMBERS pay for themselves by increasing production efficiency. Their longer spans allow a wider room, so that expensive cutting machines can be operated at full capacity. They are safe, too—will bend but not break. Permanent, they may be re-used time after time.



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UNITED STATES STEEL

October, 1940 - COAL AGE

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Wanted

ANYTHING within reason that is wanted in the field served by Coal Age can be quickly located through bringing it to the attention of thousands of men whose interest is assured because this is the business paper they read.

### **COAL CRUSHING EQUIPMENT SINCE 1885**

### **Gruendler Double Roll Crushers** at work at "Maumee"



(View of late Gruendler installation at the New Plant of Maumee Collieries Co., Jasonville, Ind.)

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### **DEMING TURBINE PUMP!**

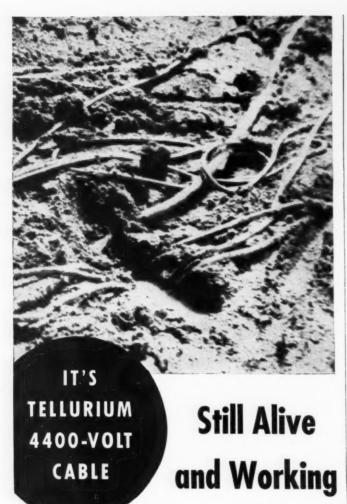
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It's true that Deming Turbines are doing a dependable and economical job of mine dewatering. We'll be glad to give you the names of mines using Deming Deep Well Turbine Pumps. Let their owners tell you what they think of them.

In the meantime, ask us to send you a free copy of an illustrated bulletin which tells what you want to know about specifications, capacities, heads, etc.

THE DEMING CO Salem. This



A CCORDING to our reporter, the cables shown are tellurium-rubber types in use on a coal-stripping operation. The large one supplies power at 4400 volts to a 30-cubic-yard stripping shovel.

After having been twisted in that muck and run over by trucks, neither cable showed a single leak or break. So far as we know, both are still supplying power at their rated voltages. Many other users report stories of similar harsh treatment, with similar results—little or no trouble. That's why, with tellurium, you can count on saving money by reducing maintenance cost.

If you have need for a tough cable that doesn't mind being dragged through mud or over sharp rocks and gravel, tellurium is your buy. This cable, specially designed for mining machinery, gathering locomotives, electric shovels—for all portable uses—will save you money both on replacements and upkeep.

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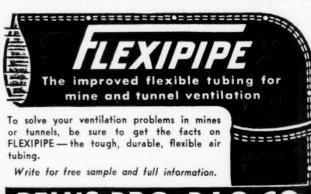
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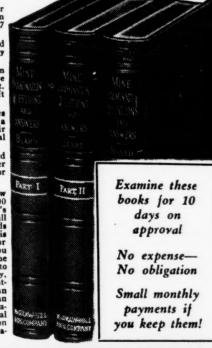
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What are the advantages and disadvantages of a gasoline pump, an air pump and an electrical pump?

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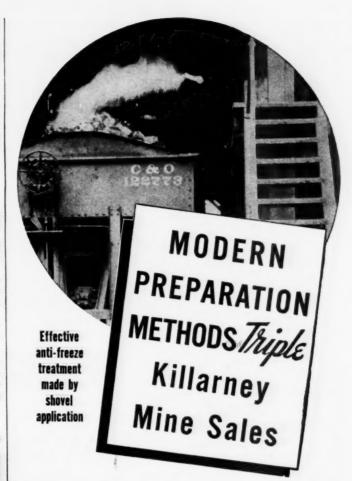
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One Goodman Standard Shortwall Cutting Machine. 3/69/229 volt, A.C. Has 6½ ft. cutter bar
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750 KW WESTINGHOUSE SYN. 275 V. 2300/
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20-Ton WESTGHE, 550 V. 909 Mts. 44"-36" Ga.
15-Ton WESTGHE, 250 V. 909-C Mts. 48"-36" Ga.
13-Ton JEFFREY, 250 V. 909-C Mts. 48"-36" Ga.
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10-Ton JEFFREY, 250 V. 91-C Mts. 42"-36" Ga.
10-Ton JEFFREY, 250 V. MH-110 Mts. 44"-36" Ga.
8-Ton JEFFREY, 250 V. MH-100 Mts. 48"-36" Ga.
8-Ton JEFFREY, 250 V. MH-100 Mts. 48"-36" Ga.
8-Ton JEFFREY, 250 V. MH-85 Mts. 36"-24" Ga.
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6-Ton WESTGHE, 250 V. 904-C Mts. 48"-42" Ga.
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500 KW GENERAL ELECTRIC SYN. 275 V.
HCC. 6 Ph., 60 Cy., 1200 RPM.
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HCC. 6 Ph. 60 Cy., 1200 RPM.
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ton Jeffrey, with MH-110 motors ton Jeffrey, with MH-110 motors ton Jeffrey, with MH-110 motors ton Jeffrey, with MH-88 motors ton Jeffrey, with MH-96 motors

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MINING MACHINES

-212G3 Goodman Lowvein AC

-12AB Goodman DC

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DC

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Good Equipment at Attractive Prices Stock list upon request

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KW Westiph 275 v. 2300/3/60 900 rpm KW Ridg, 225 v. 2300/4000 v. .8 P.F. 1200 KW Westiph. 550 v. 2300/4000 .8FF 1200 rpm KW Westiph. 275 v. 2300/3/60 900 rpm KW G. E. 275 v. 2300/3/60 1200 rpm .8 PF

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15 Ton Bald. Westph. 500 v. 909 Motors.
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HP			RPN
1 - 150	WECo	SK	175
1 - 100	WECo	sk	175
2 - 50	GECo	CD	175
1-15	GECo	RC	170
2-10	WECo	sk	170
1- 71/2	WECo	SK	170
2- 5	GECo	CD	175
1- 5	WECo	SK	175
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1-30 x 30 Jeffrey single roll with quick roll adjust. conveyor complete with steel trusses, etc

HP	SQ. CAGE	HP	RPM
-200 GECo KT	1800		
-200 GECo KT	1200		
-200 GECo KT	1200		
-201 GECO KT	1200		
-201 GECO KT	720		
-100 GECO KT	720		
-100 GECO KT	720		
-75 EDCO BK6/1200			
-75 EDCO BK6/1200			
-75 WECO CS	720		
-50 ACCO AR	3600		
-50 GECO KT	1800		
-50 GECO KT	1200		
-50 GECO KT			

GECO 1—15

SLIP RING
HP RPM

-450 WECO CW 500
-200 WECO CW 600
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-100 GECO MT 900
-82 GECO ITC 490
-75 WECO CI 990
-75 WECO CI 990
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-100 GECo 2300-230/460
-100 GECo 2300-110/220
-100 ACCo 2300-110/220
-100 ACCo 2300-115/230
-75 GECo 4000-220/440
3-75 GECo 2200-220/440
3-75 GECo 2200-220/440
3-25 GECo 2200-220/440
3-25 GECo 2200-220/440
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Jeffrey: 10 ton, 500 volt, 44" gauge, 8 ton, 6 ton, and 4 ton, all gauges, 250 volt.

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MINING MACHINES

Jeffrey, 35B, 29B, and 4—28A, 250 volt.

Goodman, 12A, 12AB, 12AA, 124AA, 12G3A.

1—212AA, 250 volt and 2—112DA, 500

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3—6 ton, 904C, 44", as is

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1—Coal Crusher, Jeffrey 24"x24", Single Roll.

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2½ ton Whitcomb 24 ga. New Batteries
24 ton G.E. 30 in. gs.

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550 v. D.C.
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100, Tank Cars; or Shells
All other types of both R.R. and Industrial Cars, too
Car Repair Parts. Full Line. Approx. 50%
saving vs. New.

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1, 30-ton Lime Gasoline Locomotive.
Locomotives; all types and kinds.

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100,000# capacity Flat bottom. Inside 40' long, 4'2" high. Vulcan U-steel side frames. Steel wheels. 8 cars equipped with 8 drop dump doors. 14 cars have solid bottom. All in very good used condition. Prompt shipment.

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40 inch gauge, Type ET, Size 3 ton, Serial No. 688 and 958, 56 cell, with storage battery switch boards. 250 volt, 100 amps. PROGRESS IRON & STEEL CO. 2035 Northwestern Pkwy., Louisville, Ky.

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### SEARCHLIGHT SECTION

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3—10-ton Goodman type 34-B motors 3—10-ton Jeffrey type MH-110 motor 4— 8-ton Goodman type 32-O motor 5— 8-ton Jeffrey type MH-100 motor 5— 6-ton G.E. type HM-823 motors 10— 6-ton Jeffrey type MH-88 motors

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Above Locomotives have been completely rebuilt.

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2-200 KW G.E. Motor Generator Set-generator type MPC-6-200-1200, form L, 727 amps., 1200 RPM, 250/275 volt D.C. synchronous motor—type ATI-6-300 KVA 1200, form C, 60 cycle, 3 phase, 1200 RPM, 75 amp. 2300/4000 volt, 300 H.P. 8 P.F.

Complete with switchboards and all necessary instruments, including a General Electric Automatic Reclosing Circuit Breaker for the DC end. Guaranteed 100% against electrical or mechanical defects.

### LOADING MACHINES

5-7BU Joy Loading Machines, 250 volt used only a short time, bargain for quick sale.

We have a world of other equipment for sale at this time such as, Motor Generator Sets, Rotary Converters, Loading Machines, Shortwall Mining Machines, Mine cars, Hoists, etc. We specialize in buying complete mines that are going out of business or from receivers in bankruptcy, administrators of estates, etc.

Our Financial Responsibility Is Your Guarantee Of Satisfaction!

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### **RECTIFIERS—New in 1932** PRICED LOW

2-850 KW. continuous, 600 volt\*DC Mercury Arc Rectifiers; complete with 3/6 phase, 25 and 80 cycle transformers; and full-automatic switchgear. Can be seen in

\*For 275 volts DC, capacity is 380 KW. continuous, 450 KW for 2 hours

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Immediate Shipment:

200 KW., 1200 rpm., 250/275 volts DC, compound wound, interpole, pedestal type rotary converter, with three 2300/4000Y volt, 1 phase, 60 cycle General Electric rotary transformers and 2300/275 volt G.E. manual switchboards

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OIL WELL GAS WELL WATER WELL MINE



IRRIGATION CONSTRUCTION QUARRY FABRICATING

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4 Jeffrey 44-DD Loading Machines, 42" gauge, 250 volts DC, 3 years old, very good condition. 5 sets Exide Batterles, 48 cells, 33 plates, 466 amp. hr., one set used only two months, all in excellent condition. Also Robinson Tub Coal Washer; large stock of new high pressure valves and pipe fittings from 1" to 6"; two coal crushers; several electric car pullers or holsts; new parts for Goodman locomotives & Cutting machines. Ironton locomotives, G. E. locomotives; many 440 volt AC motors; drag, bucket and worm conveyors.

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Acid Resisting

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Stage Single Single Single

2—Weinman	4"	2"	Single
2-Weinman	4"	4"	Two
Goyne	5"	4"	Two
Goyne	5"	5"	Two
Weinman	6"	5"	Single
Gould	6"	6"	Single
Weinman	8*	8"	Single
	PLUNGER	PUMPS	
Size	Make	Suction	Discharge
3-214 x5	Deming	1"	1"
5x6	Gould	21/4	21/4
4-5x7	Weinman	3 '-	3
6x8	American	336	3
5% x12	Gould	4 /4	4
3-6x12	Gould	4	4
	DUPLEX	PUMPS	
4-4x6	Dean	3	2
	TRIPLEX	PUMPS	
4x4	Deming	9*	216"
4×4	Deming	4	3
55x6	Deming	3	214
6-51/4x8	Deming	4	3 /2
51/2×8	Deming	5	21/2
5-51/4×8	Deming	5	4
1-7*8	Deming	8	Ä

### A.C. or D.C. Motors

WHEEL PRESS
100 ton horizontal J. T. Shaffer with 4 bars.

### MINING MACHINES

MINING MACHINES

112 AB Goodman Universal 250 v. D.C.
112 G-3 Goodman Universal 220/440 A.C.
112 D-A Goodman Universal 250 v. D.C.
CE-7 Sullivan Shortwall 250 v. 6' bar
CE-7 Sullivan Shortwall A.C. 220/440

MINE LOCOMOTIVES

MINE LOCOMOTIVES

4½ ton West. 250 v. 36/42" ga.
5 ton Ironton Stor. Battery
6 ton Atlas 220 v. 3 ph. 60 cv.
6 ton West. 904 motors 250 v. 36/42 ga.
10 ton Milwaukee GASOLINE
10 ton GE. HM-809 250 v. 42" ga.
12 ton West. 250 v. D.C.
15 ton West. 250 v. D.C.

15 ton West, 909 250 v. D.C.

SUB-STATIONS

1000 kw. West. Syn. 275 v. 22000/13000/4000 or
2300 V.A.C. Rotary
300 kw. Kidgway 250 v. 2300/33/60 m.g. syn.
300 kw. Kidgway 250 v. 2300/440/3/60 MG syn.
300 kw. West. 275 v. 2300/4000/3/60 Rotary
150 kw. West. 275 v. 2300/4000/3/60 m.g. syn.
150 kw. Ridg. 250 v. 2200/3/60 m.g. syn.
75 kw. West. 250 v. 2200/3/60 M.G.
45 kw. West. 250 v. 2200/3/60 m.g. syn.

ENGINE GENERATOR SETS

300 KW G.E. 3/60 SK. Uniflow Eng. Set
3-Duplicate 219 kva G.E. Gen. 2400/480/240/3/60
dir con 260 HP. Buckeye DIESEL
80 kva. 2300/4000 v. 3 ph. 60 cy. 900 rpm.
Fairbanks Generator dir. con, to Van Blerck Gasoline Engine.

TRANSFORMERS

Ine Engine.

TRANSFORMERS
3—333 kva. Pittsburgh 2300-230/115/1/60
2—25 kva. C.E. 2200-220/110/1/60
2—25 kva. G.E. 2200-220/440/1/60
3—37% kva. West. 22000-2200/1/60
3—37% kva. West. 22000-110/220/1/60

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frames, cast steel box bolsters, yokes, National
M-16 and Miner A-2-NW draft gears and 6 x 8
"D" and "E" couplers.

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